

# FLIGHT

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AIRCRAFT  
ENGINEER  
&  
AIRSHIPS

First Aero Weekly in the World.

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## Flight

and The Aircraft Engineer

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## EDITORIAL COMMENT

**A**T last the long-drawn-out negotiations of the Paris Conference have ended, and we have peace with Germany. Whether it is a good or a bad peace time alone will show. There are some who hold that it is a bad peace, in that it leaves Germany nothing to live for, and that she neither can nor will comply with its terms. The answer again is that time will demonstrate whether we are dealing now with a new Germany, or if the Hun remains the same treaty-breaking, political outcast he showed himself to be in 1914. There is also the reflection that had Germany won the War and stood in the place occupied by the Allies at Versailles, the case in which

she finds herself is as nothing to that in which we should have been placed. However, we can let that pass for the moment; we are not Germans.

Peace now brings with it anxieties for the future, and problems to be settled that we have hitherto refrained from approaching with the seriousness they deserve. All the world has been content to rest from the strain of prolonged war until the consummation of the final act should bring those problems into the political orbit in a manner which should admit of no further delay in dealing with them. So far as concerns our own country, these problems are many and pressing. We are loaded down by debt and taxation. There is serious unrest in the industrial world, and we are not even now able to tackle in earnest the tasks of commercial reconstruction. The same conditions in a more or less accentuated form exist in other countries, where remedies must be found if the world is to recover from the effects of five years of unexampled strife. Truly, the outlook is not without its dark side, which we should be foolish to ignore or even to discount. But, on the other hand, we have won the War. The menace of Prussian militarism which overshadowed Europe like a cloud for so many years has been utterly destroyed, and the world can breathe freely again. We have put forth colossal efforts for its destruction, and we have now to make a corresponding effort to repair the ravages of war. It is a hard task we have in front of us, but we believe the country will be as true to itself in peace as it was in war, and that we shall win through.

### An Excellent Departure

The Air Ministry has broken new ground in an excellent direction, by the regular issue for publication of items of news; interesting to those associated with aviation and to the general public as well. This is how it should be. If only each of the great Government departments were to establish its own publicity department and take the public into its confidence a little more than is the fashion, in place of adopting the lofty official attitude that departmental business is nothing to do with the public, a great deal of misunderstanding of policy would be avoided. The public, too, would begin to learn that the departments do, after all, accomplish something for the money they spend, and there would result

a better feeling of confidence in the ability of those who are entrusted with the governance of the realm. We sincerely congratulate the Air Ministry on its progressiveness in this direction and trust to see its example followed by other departments of the State.

### The Provision of Landing Grounds

The reflections set out above are the result of a Press *communiqué* from the Air Ministry relative to the provision of landing grounds for aircraft. It states that statistics collected by the Ministry show that a considerable proportion of the accidents caused by forced landings, due to engine trouble or other circumstances, might have been avoided if suitable landing grounds had been within sight and gliding distance of the aircraft at the time of the occurrence.

In a speech at the House of Commons recently, General Seely referred to this, and to the desirability of the provision of numerous emergency landing grounds. He has since addressed a personal letter on behalf of the Air Council to all Lord Lieutenants, Lord Mayors, and Governors, on the subject of the selection and allocation by private individuals and public bodies of suitable sites as such landing grounds, with a view to their being inspected, marked out, and appointed for this purpose. In this matter, as an interim measure, and until further and permanent arrangements of the nature indicated can be made, chief constables of counties can, it is thought, in conjunction with landowners and farmers, render great assistance. A personal letter has also been addressed to the chairmen of boards of directors of the various railway companies in regard to the painting of the names of places on the roofs of railway stations or other suitable spaces.

Undoubtedly the Air Ministry is proceeding on the right lines in thus seeking to enlist the help of private individuals and corporations in developing aerial transport. It is perfectly obvious that commercial aviation can only attain its proper development if the *whole* scheme is right. To complete that scheme it is equally clear that it must include a large number of such emergency landing grounds as are referred to in the *communiqué*. They mean a very great deal to the safety of aerial navigation. In fact, it cannot be said to be safe without them. At present, they cannot be provided at the public expense, nor can the pioneer companies engaged in the development of the moment provide them. The cost in either case would be absolutely prohibitive. Therefore, the only way in which the thing can be done is for public-spirited individuals and bodies who are interested in seeing that we do not lose the commanding lead in aerial navigation we assumed during the war, to come forward and assist in the manner suggested by the Air Council and General Seely.

Another direction in which a great deal must be done is in the proper sign-posting of the aerial routes. Here, again, it is obvious that if it is necessary in the interests of road locomotion that the highways should be properly sign-posted, it is ever so much more essential that the aerial routes should be similarly indicated. There are no better guides to the aerial navigator than the great trunk railways of the country. (The Huns who came to us by air during the war realised this.) But something more is necessary than that the aviator of the future may know that he is following, say, the Great Northern Railway at some point of its

course. Various suggestions have been made for the better indication of routes, and have been commented upon in *FLIGHT*. Nothing concrete has resulted so far, but we have hope that the Air Council's letter to the railway companies will be productive of much good in the required direction.

### The First of the Flying Clubs

The London Flying Club has now been launched on its way, and bids fair to become an established success. It is conceived on an ambitious scale, and with objects which are as diverse as they are likewise ambitious. Its prime purpose is to "promote and encourage flying and aerial travel of all description," and that is its all-sufficient claim upon those who are interested in the development of aviation. In course of time it will doubtless become the fashionable country club of the metropolis, besides being the hub of social flying activities. It is not so much in that connection we welcome the advent of the club. Naturally, we wish it all success in all its aspects, but it is principally because we foresee that the example thus set will, in all probability, lead to the launching of similar enterprises in other parts of the country that we are glad to see it in being.

We are very strongly of opinion that nothing better for the general cause of aviation can be imagined than that the country should possess dozens of such flying clubs. True, they cannot all be on the scale the London Flying Club plans to do things, but whether they are large or small, wealthy or of restricted means, such clubs have a distinct and useful rôle to play in the "promotion and encouragement of flying and aerial travel." As we have said many times, what is more essential than anything now and in the immediate future is active propaganda of the right sort, and we can imagine nothing better than the flying club as a means to the desired end.

### The Loan as a Remedy for Unrest

In addressing a small audience of journalists on behalf of the "Victory Loan," Sir Robert Kindersley, the chairman of the National War Savings Committee, pointed out that the swiftest and surest remedy for the present unsettled conditions in industry, and the fictitious values now maintaining, is to stabilise the financial position of the country, and that this can best be accomplished by the masses of the people investing at least something in this loan.

There is undoubtedly a large amount of truth in this. At the present moment we have an enormous transient debt, amounting to some £1,500,000,000 of short-time commitments which must be paid off very soon. The country is really in the position of the individual who has been carrying on by the doubtful expedient of "kite-flying," and we know what happens when the bills mature and there is no prospect of there being money to meet them. Either the borrower is obliged to carry over at a ruinously increased rate of interest, if his credit will allow of further borrowing, or he must file his petition. His position is one of acute financial instability, which can only be recovered by a thorough and scientific re-arrangement of his commitments. That is really the position of the country to-day. Our condition is one of instability, and the purpose of the Loan is to carry out that scientific re-arrangement of which we have spoken. Naturally, such instability of the



## Flight—And the Men

JULY 3, 1919



Brigadier-General R. M. GROVES, C.B., D.S.O., A.F.C., Deputy Chief of the Air Staff

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State means proportionate disturbance in industry and commerce, and the longer the nation's finances remain unstable, the worse the cumulative effect on the individual and on commercial relations must be. Apart, then, from all considerations of patriotic duty to the State, it is clear from this line of reasoning that the selfish interests of the individual will be best served by investment. Not only is the return on investments good—no State Loan has ever been issued on such favourable terms—but the Victory Bonds appeal to the sporting instincts of the people, while every pound subscribed assists to stabilise our credit and thus to bring about a more settled condition of affairs generally.

**The Ministry of Munitions and the War**

It may be true that the conduct of the affairs of the Ministry of Munitions has been lacking in business discernment in many directions. The reports of Comptroller and Auditor-General on its methods have made it impossible to absolve the department from charges of gross incompetence and slackness in dealing with the nation's money. But if it has wasted resources in some directions, in others it must be adjudged to have made good in the work for which it was created—to provide our fighting services with the material to aid them to achieve victory over the enemy. The enormous extent to which the tiny pre-War output of munitions of war was expanded sounds more like a romance than the statement of a series of sober facts. The Minister of Munitions, reviewing the work of his department during the War, told the House of Commons last week that, among other matters, the total number of aeroplanes we possessed at the outbreak of War was about 100. (Incidentally, this is not in accord with the figures given to the House at the time Mr. Joynson-Hicks and those associated with him in "gingering-up" the War Office, in 1913, were assured we possessed and when they were invited to go round the aerodromes and count them). At the date of the Armistice we were producing 4,000 a month!

In April last year the great German offensive was made, and the organisation was submitted to a test which tested it from top to bottom. In the course of that offensive our Armies lost 1,000 guns, 70,000 tons of ammunition, 4,000 machine guns, 200,000 rifles, 250 million rounds of small-arm ammunition, 700 trench mortars, and 200 tanks. At the time when that news began to come in there was a good deal of industrial trouble in this country. As soon as it became known in the workshops that the British soldier was fighting with his back to the wall faction and disunion were swept away, and within a fortnight every loss was replaced, in many cases by superior weapons. In August last year, when the British offensive began, in one week there was an expenditure of 2,900,000 rounds of gun ammunition, whilst in the culminating period of October last the biggest week's expenditure amounted to 3,500,000 rounds. On the day the British Army broke the Hindenburg line they fired 943,837 shells—a weight of 40,000 tons. That was a greater number fired in that 24 hours than was fired in the whole four years of the South African War. If they took the pre-War output at 55,000 per annum, it meant that our guns were firing that day every 80 minutes an amount equal to the total production before the War.

A truly marvellous record, this. It is one, too, which demonstrates as no other statistics we have ever seen could do what a wonderful potentiality for production this country possesses. If only we are true to ourselves and do not fritter away time and resources in useless discussion we have no need to fear the manufacturing activities of the greatest among the industrial nations.

#### Waste which was Not Waste

Touching upon the charges of waste and muddle which have been brought against the Ministry, the Minister went on to explain that much of this was due to the amount of experimental work which had to be carried out and the placing of contracts for supplies which had become obsolete before they could be delivered. To illustrate the point, he let the House into a little bit of interesting secret history. He told them he held in his hand specimens of the bullets which stopped the German air raids on this country. There were six different types of bullet used at one time or another for that purpose. The first issue was indistinguishable from the bullet an infantryman fired from his rifle, and the subsequent changes, although almost imperceptible on a casual examination, resulted in the production of the bullet which, used against the raiders on Whit-Sunday of last year, prevented any further German air raids on this country. It was true, he said, that the money spent on some of the types of bullet was not remunerative if judged by ordinary peace standards, but if the computation were to be made on the ground of loss of money alone, there ought to be placed on the other side of the account the saving to the State, not only of lives, but in respect of the interference with supplies and material damage. On the day after Whitsuntide of last year it was known the Germans had prepared for an air raid on this country by heavier-than-air machines greater than ever before. But the enemy airmen did not come, because they knew of the reception which had been given them on Whit-Sunday.

It is very interesting, and as a defence of the methods of the Ministry in production and experiment it may be passed as quite convincing. We have already said that the record of the Ministry in these directions is perfectly wonderful and rebounds vastly to its credit. But we really must point out, though we did not set out to be critical, that all these tit-bits of inside history and the records of experiment and production do not dispose of the charges of, for instance, paying large accounts twice or even three times over. Still, it was an able and generally a convincing outline of a stupendous task well carried out.

#### The Linen Deal

Another topic of interest dealt with in the speech was that of what has now come to be known as the "Linen Deal." The production of linen at the time of the Armistice had been brought up to 7,000,000 yards per month, and the Ministry found that it had 43,000,000 yards on its hands, for which they had paid from 1s. 3d. to 4s. a yard.

The obvious thing for the Government to do, finding themselves with all this linen on their hands, was to try to get it back into the hands of the traders who knew the business. If it had been possible to come to terms with the linen manufacturers that





**LONDON FROM ABOVE.**—A very remarkable photograph of Charing Cross, the "Hub of the Universe," Trafalgar Square, the Admiralty Arch, and the surrounding district, taken by the Aircraft Manufacturing Company, Ltd., to illustrate Mr. Holt Thomas's speech at the London Society on June 26. Minute examination of buildings and streets is well repaid, and from the picture quite a new "vision" of London is obtainable.

course would have been taken. But they were not prepared to give more than 1s. a yard for 43,000,000 yards. They came forward subsequently with a proposal to join the Disposal Board in selling the linen on a profit-sharing basis. Under this plan the trade would have borne 25 per cent. of any loss below 1s. 1d. per yard and would have received 25 per cent. of any profit over that figure. This offer was declined by the Disposal Board. That they acted in the public interest was shown by the contract into which they had since entered. They had got 1s. 8d. a yard. If they had accepted the offer of the linen manufacturers they would have had to hand to them over £300,000, which now went into the pockets of the taxpayers.

## ■ ■ ■ AIR MAILS V. CABLES

PRESIDING at a meeting of the London Society on June 27, Lord Montagu said that we should live to see a park like St. James's Park or the Green Park covered with a great glass roof, which would be the central landing stage of London. There would be the aeroplanes landing on the roof, light and sunshine pouring through the glass, the sides open and the wind blowing through, and underneath, so to speak, an open winter garden. He also said that London must be the centre for the meteorological research of Western Europe. Meteorology and navigation were the two most important things to study in aviation to-day. Geographically speaking, the position of London in regard to Western Europe was the most important. We were the nearest of all the big capitals to the Atlantic, and our meteorologists were, owing to the difficulties of foreseeing the variations in our changeable climate, possibly as good as, if not better than, any in the world.

Mr. G. Holt Thomas then gave a lecture on London and its future aerial transport. He confessed that he could not imagine, enthusiast as he was, that internal flying in London was going to render any great service; he could not see aeroplanes conveying mails from the General Post Office in the City to the Post Offices of the West End, although it was impossible to prophesy safely as regarded flying in view of the enormous progress recently made. As the London Society were out to secure open spaces, and consequently better health for the population of London, they would, he thought, some day be working hand in hand with those interested in aircraft, with the object of securing large open spaces in the centre of populous districts. A central aerodrome would be almost the first item planned in new towns.

Remembering London's experience of air raids, he urged the need of a sufficiently large air force being kept in existence to repel possible future attacks by air. He had no doubt that all who had read the newspapers thought that a League of Nations, though very desirable, was rather doubtful, and that if we were left without an Air Force we should be in a very precarious position.

After referring to recent long-distance flights, Mr. Holt Thomas said one could get to Paris to-day quite easily and comparatively comfortably by train and boat, but nothing but the aeroplane would carry either passengers or letters in 2½ hours, and he saw aircraft competing much more with cables, for instance, than the train. He would go so far as to say that if he started an aeroplane, say, every two hours from London to Paris, and *vice versa*, no more telegrams would be sent, as they could convey words far more cheaply than any cable or telegraphic system and much faster.

He did not think anyone would send a telegram to Paris

Before this very clear explanation of the Government point of view was made, we said that so far as it was possible to discern from the facts, the Government appeared to have done the best possible thing in the circumstances. Neither the Belfast trade nor the retailers would have anything to do with the linen, except on terms which were not, to say the least, precisely favourable to the taxpayer. Mr. Martin seems to have come along with a firm offer of a fair price for the whole quantity and the Ministry closed with it. That seems to be all there is to be said about it, until we know what is to become of the linen and whether or not the deal will result in the creation of a corner in linen.

again, if a letter could be delivered in 2½ hours, as no telegram was as efficient as a letter, as one could not convey, except at enormous expense, the sense of the message. It was impossible to convey photographs, blue prints, deeds, certificates, and valuable documents of all kinds.\*

It was therefore evident that if the aerial mail could convey, with sufficient regularity, something which the telegraph could not convey, and at a much lower rate, it had a very serious future. London and commerce, on which we all live, was entirely dependent on rapidity of communication. It was especially important to have quick means of communication between London and every city of the Empire.

It cost 2d. per word to send a telegram from London to Paris. Assuming that it cost £120 to fly from London to Paris, and taking one of his own machines, which was to-day used on the military service between London and Paris, they could carry (he was quoting Gen. Sykes) 672 lb. of matter. Assuming such a low weight as 2,000 words per ounce—he thought it could safely be put at 5,000—the number of words carried would be 21,500,000, which worked out at so low a figure that one could hardly talk about the price per word. As the calculation would show, they could carry words at 700 a penny.

The same calculation showed one—and this was a subject which they had been specially studying—how the telegraphic and telephonic communication of this country could be linked up with the telegraphic and telephonic services of another country. There was another reason for talking chiefly of mail and matter, as compared with passengers—viz., the expense. Suppose it cost 10s a mile, or £120, to fly to Paris, carrying two passengers. The price of £60 was almost prohibitive. But consider the weight, say, of two 11-stone passengers as made up of half-ounce letters, and the situation was completely changed. The two 11-stone passengers equalled 9,856 letters, and at the same price per trip, the transport of the letters cost about 3d. each. The charge would, of course, have to be much higher because one would not get 10,000 letters to deliver. Also a special form of collection and delivery would have to be arranged for, as it was no use flying from London to Paris in two hours and taking four more to deliver letters to their destination. Every one must recognise that speed must be paid for.

Alluding to the possibilities of stereoscopic photography in charting unsurveyed country, Mr. Holt Thomas said that a single aeroplane had in one flight completely covered with photographs an area of 40 square miles. The cameras used for this work were quite automatic and once started would go on taking photographs of whatever was under them, without any attention until the film was used up.

## ■ ■ ■ "R.34" STARTS FOR AMERICA

AT 2.48 a.m. on the morning of Wednesday, July 2, "R. 34" started from her aerodrome at East Fortune and commenced her journey to America. As she rose the airship was lit up by arc lamps on the roof of the huge hangar, and with lights shining out of the portholes in her cabin and engine cars, she formed a fine sight. There was a slight Scotch mist at the time of the start, and the airship was soon lost to sight, disappearing towards the Firth of Forth, although the sound of her Sunbeam engines could be heard for a considerable time after she had disappeared from view. As related elsewhere in this issue the "R. 34" carries an excellent wireless set, which will enable her to be in wireless communication with wireless stations ashore or on board

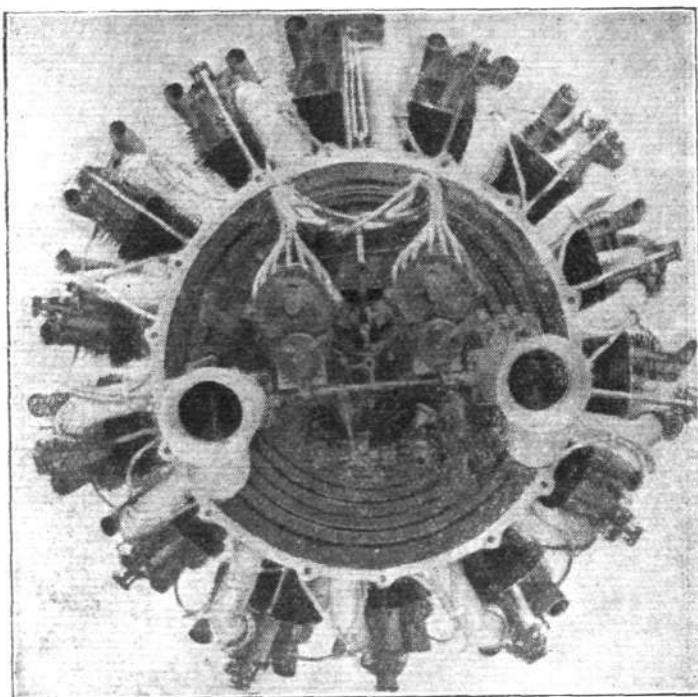
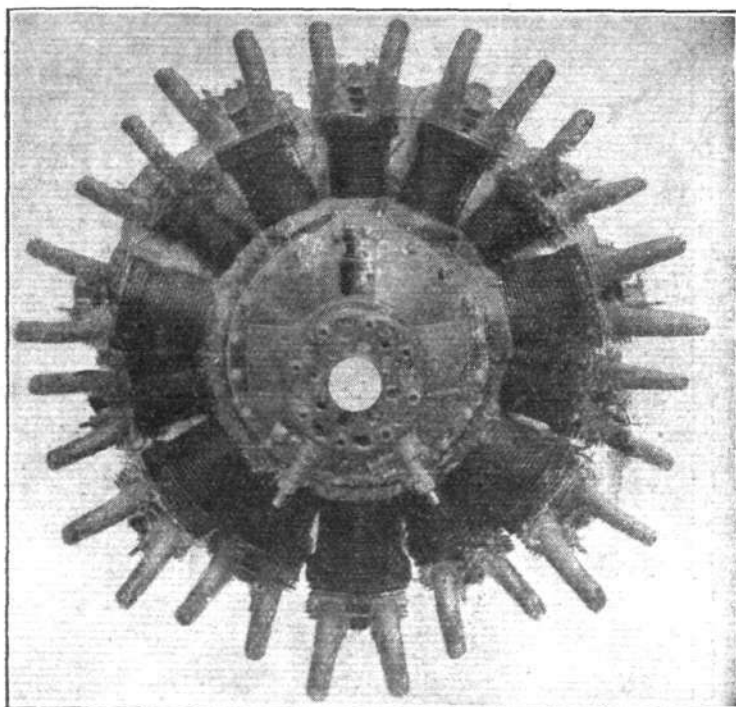
ships during the whole of her voyage. Up to the time of going to press three messages had been received by the Air Ministry from the Commander of "R. 34," Major G. H. Scott. The first, at 6.50 a.m., read: "Off Rathlin Island, North-East Ireland. Steering West. Going well. Fine." The second message at 9 a.m. read: "Position 55 deg. 20 min. North, 10 deg. 40 min. West. Speed 40 knots. Up-to-date average speed 45 knots." At 11.5 a.m. Major Scott reported "Going through thick fog. Everything going well." Providing weather conditions are not too unfavourable the "R. 34" should be able to reach New York during Saturday next (July 5), while if any following winds are encountered she may even arrive on Independence Day.



## THE COSMOS AERO ENGINES

THE peculiar conditions under which aeroplanes were working during the War—especially those used for fighting—have led to an extensive development of the radial air-cooled aero-engine, a type which previously was represented by only a few examples, and which was thought by many to be going out of fashion. The reasons for its restored popularity—and there can be no doubt that, at any rate towards the

It might be argued that for commercial flying manoeuvrability will not be of such vital importance as it was in the case of the fighting aeroplane, and that, therefore, overall length will not count to the same extent, while light weight per h.p. will be of less moment than reliability. Granting that this is so, and that in the list of qualities which the commercial aero-engine must possess, reliability should

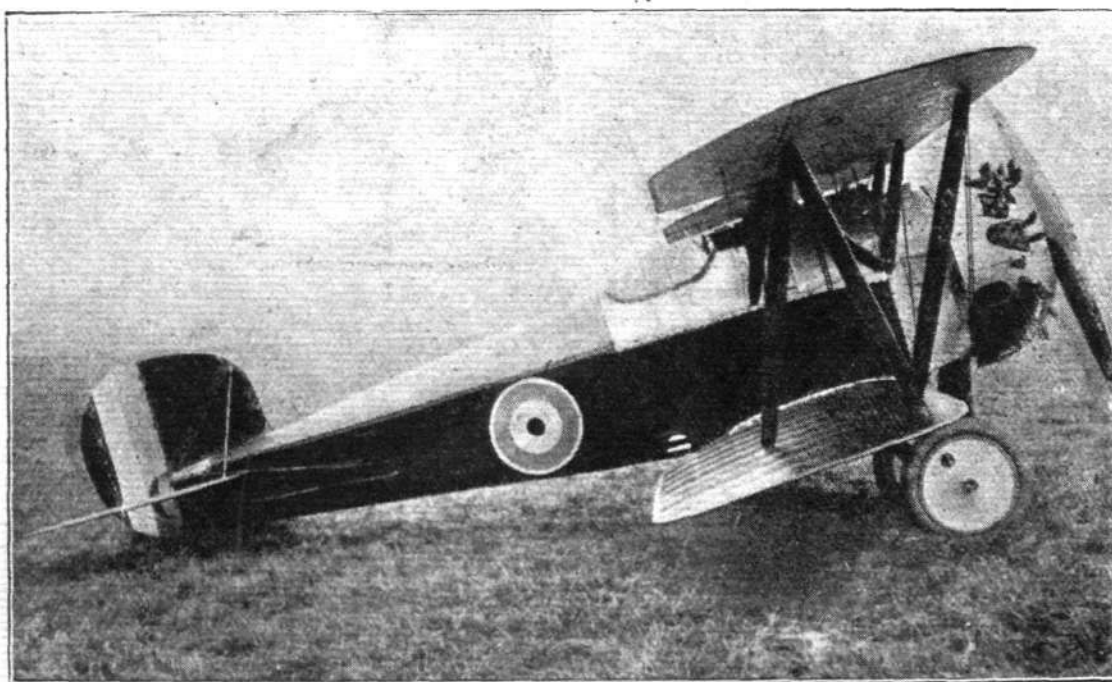


THE COSMOS 300 H.P. "MERCURY" ENGINE.—Front and rear view.

latter part of the War, this type was the subject of very thorough research—are various, but chief among them is undoubtedly the fundamental advantage of the radial type as compared with others; that of short overall length. This enables the aeroplane designer to mass his heavy weights close together, thus reducing the longitudinal moment of inertia of his machine to a minimum, which is a desirable feature in a fighting machine that has to be capable of very quick manoeuvres. Combined with this, experience has shown that a well-designed radial engine can be produced having a very high power-weight ratio.

come first, it should not be forgotten that, generally speaking, the machine whose engine is of light weight per horse-power, will have a greater paying cargo capacity than one fitted with a heavier engine. Therefore, other things being equal such as reliability and fuel consumption, the light engine will still score in commercial aviation.

Among those who believe that the radial air-cooled aero-engine offers great possibilities in weight reduction, even after reliability and low fuel consumption have been ensured, is the Cosmos Engineering Co., Ltd., of Fishponds, Bristol, whose post-War programme is based entirely on the pro-



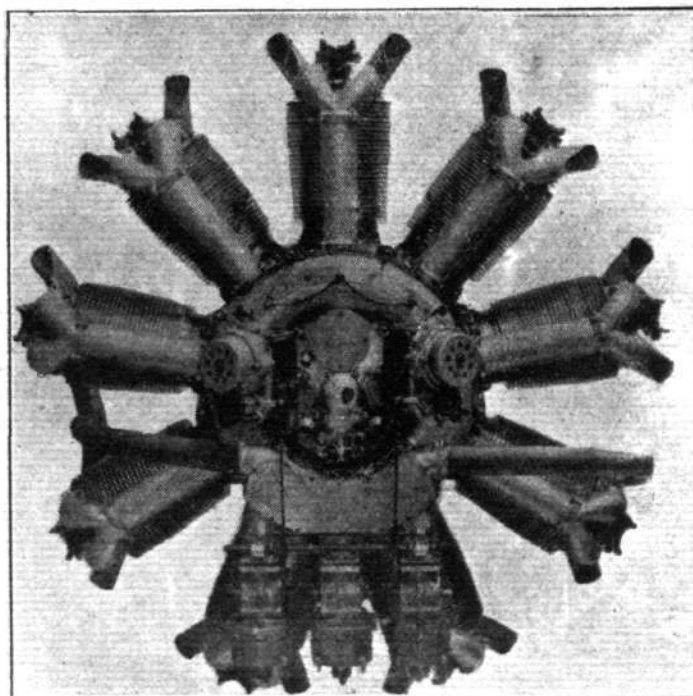
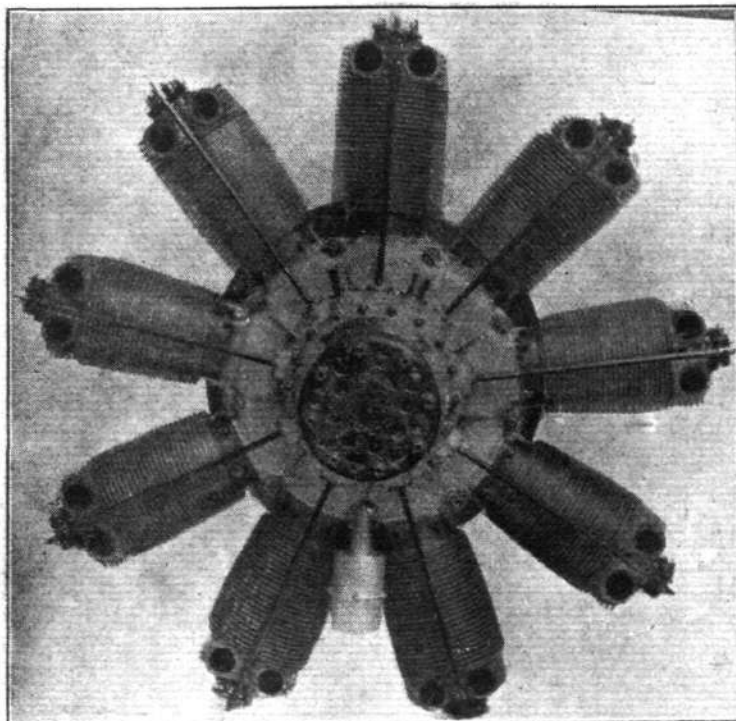
The Cosmos 300 h.p. "Mercury" engine in a "Bristol" scout.

duction of engines of this type. Before proceeding to give a brief description of the various types of engines made by this firm, a few historical notes may be of interest.

The entry of Messrs. Brazil, Straker and Co., Ltd., into the field of aero engine manufacture dates back to the summer of 1915, when aero engine work was undertaken for the Air Department of the Admiralty. Ever since then the firm has been engaged upon work for this department and, later, for the Air Ministry, the work including the reconstructed Curtiss, and the "Hawk" and "Falcon" Rolls-Royce aero engines. Incidentally, it might be mentioned that,

for the management of the Cosmos Engineering Co. realised the importance of not attempting to carry out experimental work in the production factory and, more than two years ago, an entirely separate experimental factory was formed which is organised and controlled by a separate experimental staff.

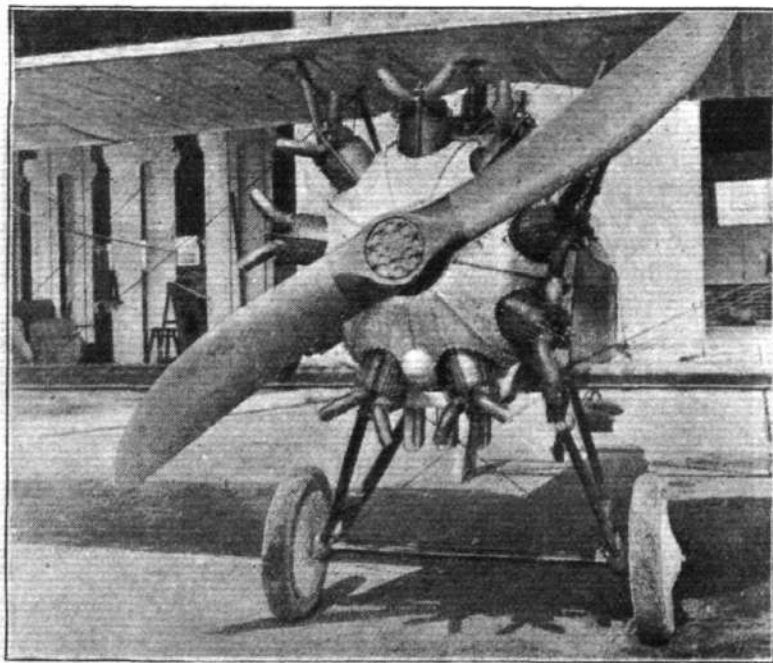
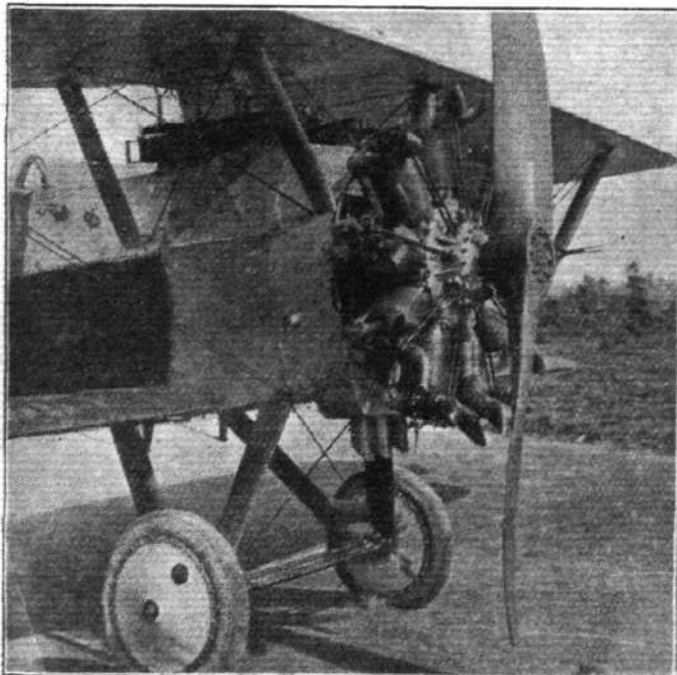
The experimental department of the Cosmos Engineering Co., Ltd., is now one of the best-equipped in the country, being installed in new buildings, with a new machine shop, and with an excellent test house in which new features of design are thoroughly tested out before being finally adopted.



THE COSMOS 450 H.P. "JUPITER" ENGINE.—Front and rear view.

so far as we are aware, this is the only firm which has been entrusted with the manufacture of Rolls-Royce engines, apart, of course, from Messrs. Rolls-Royce themselves. Also, with the exception of the original experimental engine, Messrs. Brazil, Straker and Co., Ltd., have produced the whole output of the R.R. "Hawk" engine. At the close of 1918 the firm of Brazil, Straker and Co., Ltd., was reconstructed, and became the Cosmos Engineering Co., Ltd., and, as already mentioned, the firm has decided on a post-War programme concentrating on the production of radial air-cooled engines. Already during the War those responsible

One part of the building is fitted up for the testing of separate cylinders, the power developed, the petrol and oil consumption and the temperature being taken and noted. When a single cylinder has in this manner been thoroughly tested out and has fulfilled the rigorous demands imposed by Mr. Fedden, technical director of the firm, a complete engine is erected and tested in another shop where such parts as were not incorporated in the test of separate cylinders are given a thorough try-out. When parts have been tested here, and any of them that proved unsatisfactory have been re-designed and tested, the complete engines are given long



The Cosmos "Jupiter" engine, 450 h.p., installed in a "Bristol" Badger. In the left-hand photograph the engine cowl has been removed to show the mounting.



endurance tests during which the power, speed, fuel consumption, etc., are read off and noted. When prolonged tests have failed to reveal any more improvements, and not till then, the engine is installed in an aeroplane and given its flying tests. If any defects are developed during these, the engine is returned to the works and the defective parts re-designed and tested until satisfactory, when all the tests on the bench as well as in the air, are gone through again. It will be obvious from the brief indication given of the thoroughness of the experimental work done on an engine before it is allowed to pass from the experimental into the production factory, that the Cosmos engines are not just designed to look pretty on paper and excellent in theory, but have to pass through the hard tests of practical experience, in which faulty or unsatisfactory design is ruthlessly scrapped. By thus insisting on perfection, and refusing to accept anything short of what he demands of his engines, Mr. Fedden is laying for the Cosmos engines a foundation on which to build a great reputation in future commercial aviation.

It has already been pointed out that the Cosmos Engineering Co., Ltd., is concentrating on one type of aero engine, the radial air-cooled. Within this type, however, four different models have already been designed, two of which are in production, while the other two, although they have been experimented with, have not yet fully convinced Mr. Fedden that they are ready for passing into production. From what has been said regarding the thoroughness of the Cosmos testing, it will be realised that when the other two models are placed on the market, they may be expected to perform according to promise.

#### The Cosmos "Mercury" Engine

Of the two models which have passed into production the "Mercury" was designed first. It was designed in 1917 and perfected in the early part of 1918. This engine was produced to conform to the special requirements of the Government, i.e., it was designed within the limits of 42 ins. maximum diameter, its overall dimensions being 41½ ins. The "Mercury" is a 14-cylindrical radial engine, with its cylinders in two rows of seven each, the cylinders of the back row being placed opposite the spaces between the cylinders of the front row.

The main features of the engine are as follow: Bore and stroke 4½ ins. by 5½ ins. Normal power (calibrated on Froude dynamometer) 315 b.h.p. at 1,800 r.p.m. Maximum b.h.p. 347 at 2,000 r.p.m. Total weight with full equipment, including carburettors, magnetos, Remy distributor and coil, and Constantinesco gun gear—587 lbs. (This weight does not include exhaust pipes, as these are specially designed to suit the machine into which the engine is being fitted.)

The cylinders are of steel, machined from the solid, with fins formed integral with the cylinder barrel. The cylinder head is a separate aluminium casting carrying the valves and valve rockers and, owing to the heat conductivity of this separate cylinder head, the cooling is more effective, while the liability to distortion is claimed to be reduced to a minimum. There are three valves per cylinder, two exhaust and one inlet. The valves are operated via push rods located at the rear of the cylinders, by a double cam ring at the back of the engine. The crankshaft is of the two-throw type, and runs on roller bearings. As the drive is direct, the propeller shaft is integral with the crankshaft. The connecting-rods are of special design to accommodate the roller bearings. It might be mentioned that both the crankpins and crankshaft and also the connecting-rods are case-hardened and ground.

The crankcase is a one-piece casting, the holes for the cylinders being arranged in a slight spiral to accommodate the grouping of the connecting-rods. The back of the crankcase is provided with a rigid circular flange of large diameter through which pass the bolts attaching the engine to the fuselage. This simple form of support has been found quite satisfactory in practice. Between this circular flange and the back cover of the crankcase are the two circular induction chambers through which the two-cylinder groups are supplied with gas from two carburettors.

Dual ignition is provided, by two M.L. 7 cyl. magnetos in conjunction with the 14 cyl. Remy distributor and coil.

Lubrication is on the dry sump principle, there being two spur-gear pumps, one of which is a delivery pump sucking oil from the tank and delivering it, under pressure, of course, to the hollow crankshaft and other bearings, separate leads going to the auxiliary drives. Another pump sucks the oil

from the crankcase and delivers it back to the main supply. There are two filters in the oil system.

#### The Cosmos "Jupiter" Engine

Although differing in many details from the "Mercury," the "Jupiter" engine has many features in common with its prototype. It is, however, a nine cylindered single-row engine. It will be marketed in two types, series 1 being of the direct-drive type, while in the series 2 type there is an epicyclic reduction gear giving 1,300 r.p.m. to the propeller shaft. The direct-drive engine has the following main features: Bore and stroke 5½ ins. by 7½ ins. Normal power 450 b.h.p. at 1,800 r.p.m. Total weight including carburettors, magnetos, electric starter, Constantinesco gun gear, and all accessories, 662 lbs. The series 2 engine is rated at 500 h.p.

Except for the difference in dimensions the cylinders of the "Jupiter" are, generally speaking, similar to those of the "Mercury," having the same separate aluminium head, which has again been successful in avoiding distortion and maintaining a high B.M.E.P.; about 118 lbs., we believe. There are four valves in each cylinder, two inlets and two exhausts.

The crankshaft, needless to say, is of the single-throw type and is a solid shaft made of K1 steel, running in roller bearings. The connecting-rod assembly differs from that of the "Mercury" in that there is a master connecting-rod with eight articulated rods. The master rod has a white-metal lined bearing.

The crankcase is a two-piece aluminium casting, split vertically, with long bolts passing right through the crankcase and holding the engine to the fuselage. One of the most interesting features of the "Jupiter" engine is the induction system. There is an annular induction chamber, provided with a cover, machined on the inside, into which is fitted a spiral aluminium casting which forms the distribution system of the engine. The pitch of this spiral casting is such that by bolting the three carburettors on to the cover of the annular induction chamber one carburettor feeds three cylinders in proper rotation. This forms a special, patented feature of the "Jupiter" engine. The advantages claimed for it are that it ensures an excellent distribution of the mixture, and at the same time obviates cutting-out of the engine in the event of one cylinder getting out of commission, as each of the three carburettors has an entirely separate induction system, isolated from the other two.

As in the "Mercury," dual ignition is provided, the two magnetos being Thomson-Bennett 9 cyl. driven by bevel gearing off the crankshaft. As will be seen from the rear view of the engine, the magnetos are mounted at an angle to the back cover, so that when the engine is installed in an aeroplane the contact breakers, etc., are readily accessible. The lubrication system is similar to that of the "Mercury," i.e., it is of the dry-sump type, with two pumps; one delivery pump and one suction pump.

Both the "Mercury" and the "Jupiter" engines have, as already mentioned, passed their bench and flying tests, and have gone into production. The former was installed in a Bristol scout, which gave the following performance: Climbed to 10,000 ft. in 5 mins. 25 secs.; to 20,000 ft. in 16 mins. 15 secs. Speed at 10,000 ft. 143 m.p.h. The "Jupiter" fitted on a Bristol "Badger" biplane, has also given very good results, as the following performance figures indicate: Total weight of machine, including pilot and passenger, military load, two machine guns, etc., 2,800 lbs., engine revolutions on ground, 1,550 r.p.m.; average revs. when climbing at 80 m.p.h., 1,600 r.p.m.; revs. flying level at 7,000 ft., at a speed of 125 m.p.h., 1,850 r.p.m. The times for climbing were: 2,000 ft. in 1 min. 4 secs.; 4,000 ft. in 2 mins. 10 secs.; 6,000 ft. in 2 mins. 33 secs.; and 7,000 ft. in 4 mins. 15 secs. The figures relating to the performance of the "Badger" are not official, but were, we understand, obtained during preliminary tests.

As already mentioned, the Cosmos Engineering Co., Ltd., will market, later on, two more models. One of these will be a three-cylinder radial air-cooled with a bore and stroke of 5½ ins. by 6½ ins. It will be known as the "Lucifer," and is expected to develop about 100 h.p. for a weight, complete of about 220 lbs. The second model will be a large one of about 1,000 h.p., and will, in effect, consist of a two-row "Jupiter." The bore and stroke will be 6½ ins. by 7½ ins., and the weight is not expected to exceed 1,400 lbs. complete.

#### Removal of Air Ministry Meteorological Branch

THE Air Ministry Meteorological Branch has removed to Canada House, Kingsway. The address for correspondence is: Secretary, Air Ministry (F.O. 5), Canada House, Kings-

way, London, W.C. The telegraphic address will be as heretofore, Flyingdom, Phone, London. Requests for weather reports by telephone should be made to Holborn 2951, Extensions 520, 521, 522, 523, 524 or 525.

# The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

## TECHNICAL AND COMPETITIONS COMMITTEE

A MEETING of the Technical and Competitions Committee was held on Monday, June 30, 1919 when there were present: Lieut.-Col. F. K. McClean in the Chair, Mr. Griffith Brewer, Lieut.-Col. T. O'B. Hubbard, M.C., R.A.F., Maj. R. H. Mayo, Lieut.-Col. Alec Ogilvie, R.A.F., and Mr. H. E. Perrin, Secretary.

**Classification of Aerodromes.**—The Committee considered the draft scheme for classification of Aerodromes received from the Air Council. A report was drawn up for submission to the Committee of the Club.

**Jacques Schneider Maritime Cup.**—The arrangements in connection with this Competition were considered.

**Flight from England to Australia.**—The supplementary regulations suggested by the Australian Commonwealth were considered and approved.

## COMMITTEE MEETING.

A Meeting of the Committee was held on Tuesday, July 1, 1919. when there were present:—Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the Chair, Mr. E. C. Bucknall, Mr. G. B. Cockburn, Lieut.-Col. T. O'B. Hubbard, M.C., R.A.F., Lieut.-Col. F. K. McClean, Lieut.-Col. Alec Ogilvie, R.A.F., Col. C. R. Samson, D.S.O., R.A.F., Mr. A. Mortimer Singer and Mr. H. E. Perrin, Secretary.

**New Members.**—The following New Members were elected:—

- Capt. Sir John Alcock, K.B.E.
- Lieut. Douglas Henry Walter Arnot (Argyll and Sutherland Highlanders).
- Lieut. Sir Arthur Whitten Brown, K.B.E.
- Basil Johnson.
- Maj. Charles Henry Chichester Smith, R.A.F.
- Sir Charles Cheers Wakefield.

**Classification of Aerodromes.**—The report of the Technical and Competitions Committee was received and approved and ordered to be sent to the Air Council.

## Jacques Schneider Maritime Cup

The Jacques Schneider Maritime Cup having been won in 1914 by C. H. Pixton on a Sopwith Seaplane, the nominee of the Royal Aero Club representing the British Empire, the Race for 1919 will be held in England early in September next; the exact date and place will be announced later.

The Race will be over a distance of 200 nautical miles exclusively at sea, in a closed circuit having a minimum course of five nautical miles, and situated outside any port or enclosed harbour. At least two alightings must be made on the water at points fixed by the Officials.

The Committee of the Royal Aero Club will select the three competitors to represent the British Empire, and reserves to itself the right to hold eliminating trials.

Entries are to be made at the Royal Aero Club, 3, Clifford Street, London, W. 1, not later than July 31, 1919. Each entry must be accompanied by the Entry Fee of £20.

## Aviation Insurance

The Royal Aero Club has given its official approval to the Aviation Policies of the Aviation and General Insurance Co., Ltd., 56, St. James Street, London, S.W. 1, and arrangements have been made for Members of the Club to receive a rebate of 20 per cent. upon all Premiums.

A feature of the Policy issued by the Aviation and General Insurance Co., Ltd., is that in the event of any difference of opinion arising, the same shall be settled by an arbitrator or arbitrators to be appointed by the Committee of the Royal Aero Club whose decision shall be binding.

## Gold Medals for Capt. Sir John Alcock, K.B.E., and Lieut. Sir A. Whitten Brown, K.B.E.

The Committee at its Meeting on June 17, 1919, unanimously resolved to award the Gold Medal of the Club to both Capt. Sir John Alcock, K.B.E., and Lieut. Sir A. Whitten Brown, K.B.E.

These Medals were presented by the Chairman of the Club, Brig.-Gen. The Duke of Atholl, K.T., M.V.O., D.S.O., at the Club's Banquet on June 23, 1919.

## Certified Trials

### GENERAL REGULATIONS

(Under the Competition Rules of the Royal Aero Club)

1. **Object.**—The object of the Trials is to test the merits of an aircraft as a whole or in part, or of an accessory under various conditions. The competitor may make a request to have any particular quality or merit tested and certified.

2. **Certificates.**—The Club will give a Certificate of the actual performance during the Trial, and an official observer, or observers will be provided for the Trial by The Club. The Certificate shall be a record of the Trial containing such details of the aircraft or part thereof under Trial, and any observations The Club may find desirable. The Club undertakes that a copy of each Certificate shall be published in the Official Organ of The Club.

3. **Observation.**—The Trial shall be under the control and observation of The Club. The Club reserves the right to stop a Trial if, in its opinion, such Trial from any cause would tend to endanger life or limb.

4. **Trial Void.**—Should the competitor be prevented from carrying out the Trials owing to the absence of the observer, or from any cause within The Club's control, The Club may issue such Certificate as the occasion warrants and at its discretion return the whole or part of the entry fees. Should the Trial be postponed or cancelled at the request of the competitor, the entry fees will not be returned.

5. **Withdrawal.**—The competitor may, at any time before the completion of the Trial, give notice in writing to The Club that he wishes to withdraw from the Trial, and shall state his reason. In the event of such notification, the aircraft shall, at the discretion of the observer, remain under observation until the cause thereof has been investigated and the aircraft released by The Club.

6. **Working Hours per Day.**—An aircraft in flight shall not be observed save between the hours of sunrise and sunset, unless particular provision is made therefor in the Regulations agreed to by The Club.

7. **Start and Finish.**—Trials shall start from, and finish at, or be held at, such places as may be agreed to by The Club. The Competitor shall give notice to the observer of his intention to commence the Trial, and the observer shall record the moment of starting.

8. **Entries.**—Every entry shall be made upon the official Entry Form of The Club, and shall state the nature of the Trial, and the number of days to be occupied.

No entry will be accepted unless accompanied by the entry fee, which is not returnable, except as laid down herein.

The Club reserves the right to refuse any entry without giving a reason, or to limit the length of any Trial at its discretion.

9. **Fees.**—Fees for the Trial shall be determined by The Club in accordance with the nature, duration, and venue of the Trial.

10. **Advertising the Trial.**—A competitor by entering for a Trial agrees to accept the official records of The Club, and authorises The Club to publish them in such manner as The Club thinks fit. The competitor may publish only the full and complete Certificate issued by The Club. In the event of his desiring to publish, by way of advertisement or otherwise, any other matter relative to the Trial, he shall submit a proof of such matter to The Club before its publication, and he undertakes not to publish any such matter until he has received the written authority of The Club.

11. **Unrecognised Trials.**—No Trial shall be recognised except such as is officially observed or sanctioned by The Club. Should an unrecognised Trial be held, and should any publicity or advertisement be given thereto, any person taking part in such Trial and/or the manufacturers and/or the machines shall be liable to disqualification and suspension.

12. **Responsibility for Damage.**—A competitor by entering waives any right of action against The Club for any damages sustained by him in consequence of any act or omission on the part of the officials of The Club or its representatives or servants or any fellow-competitor.

The aircraft shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself, or his aircraft, or his employees or workmen, and to assume all liability



for damage to third parties or their property, and indemnify The Club in respect thereof.

13. *Definitions.*—In these regulations the word "aircraft" shall be held to mean the aircraft and/or its parts and/or accessories, whether under test or not; the word "competitor" shall include any person or body making entry for or taking part in any Trial or Competition, except any passenger other than the driver or mechanic; the word "entrant" shall mean the person or persons entering the aircraft for a Competition.

14. *Interpretation of Regulations.*—The interpretation of these Regulations shall rest entirely with The Club, which may from time to time alter, add to, or omit from them, and may in the case of any special Trial modify the Regulations to suit a particular case.

#### **Certified Trials. Speed**

(Under the Competition Rules of the Royal Aero Club)

##### **REGULATIONS (Aeroplanes)**

1. Certificates of speed will be delivered in respect of flights over a straight course of not less than one kilometre. Each trial shall consist of four flights out and back in quick succession, and the times will be taken at the moment of passing each mark. The speed of the trial shall be the mean of the speeds of the flights out and back.

2.—The Competitor shall rise from the ground to the height at which he proposes to cover the measured distance, and shall maintain approximately the same level throughout the trial.

3.—All flights must be controlled by one official observer assisted by at least one official timekeeper, both previously approved by The Club, and a mark-keeper, approved by the observer, at each mark.

4.—The course over which the flight is accomplished must be certified by a surveyor approved by The Club, and checked by the observer, the surveyor's plan being lodged with The Club.

5.—Entries must be made upon the Entry Form provided for the purpose, and must be accompanied by a remittance of £5 5s., the amount of the fee. The Entry Form, which must be duly filled up as regards the nature of the test and full particulars of the Aeroplane, must reach the Secretary at least seven days prior to the Trials.

*If desired by the Competitor the carried weight shall be recorded on the Certificate. For details, see Regulations 1, 2 and 3, Weight carrying.*

#### **Certified Trials. Vertical Speed.**

(Under the Competition Rules of the Royal Aero Club)

##### **REGULATIONS (Aeroplanes)**

1.—Certificates for vertical speed, i.e., climbing speed, will be delivered in respect of flights recorded by barograph and controlled by an official observer appointed by The Club.

2.—The barograph must be provided by the Competitor, and be provisionally approved, set, and sealed by the observer prior to the start.

3.—The record sheet of the barograph must travel at least 6 inches in one hour.

4.—The test shall be reckoned to have commenced at the time when the Competitor shall have risen 100 feet as registered on the barograph.

5.—The Certificate will state the time taken to rise 1,000 feet, 2,000 feet, and so on per 1,000 feet above the 100 feet starting level. Failure to attain a height of 1,000 feet above the starting level will be recorded on the Certificate.

6.—After the descent the Competitor shall deliver the barograph to the observer, who shall take charge of it and deliver it sealed to the Royal Aero Club for examination. In the event of the Competitor alighting at a distance from the starting point, he shall immediately take steps to inform the observer of his whereabouts.

7.—Entries must be made upon the Entry Form provided for the purpose, and must be accompanied by a remittance of £5 5s., the amount of the fee. The Entry Form, which must be duly filled up as regards the nature of the test and full particulars of the Aeroplane, must reach the Secretary at least seven days prior to the Trials.

*If desired by the Competitor the carried weight shall be recorded on the Certificate. For details, see Regulations 1, 2 and 3, Weight carrying.*

#### **Certified Trials. Height**

(Under the Competition Rules of the Royal Aero Club)

##### **REGULATIONS (Aeroplanes)**

1.—Certificates of height will be delivered in respect of flights recorded by sealed barograph. The ascent must be performed in the presence of an official observer, who will,

independently of the barograph, record the time of leaving the ground, and, if possible, alighting.

2.—The barograph must be provided by the Competitor, and be provisionally approved, set, and sealed by the observer prior to the start.

3.—After the descent the Competitor shall deliver the barograph to the observer, who shall take charge of it and deliver it sealed to the Royal Aero Club for examination. In the event of the Competitor alighting at a distance from the starting point, he shall immediately take steps to inform the observer of his whereabouts.

4.—Entries must be made upon the Entry Form provided for the purpose, and must be accompanied by a remittance of £5 5s., the amount of the fee. The Entry Form, which must be duly filled up as regards the nature of the test and full particulars of the Aeroplane, must reach the Secretary at least seven days prior to the Trials.

*If desired by the Competitor the carried weight shall be recorded on the Certificate. For details, see Regulations 1, 2 and 3 Weight carrying.*

#### **Certified Trials. Weight Carrying**

(Under the Competition Rules of the Royal Aero Club.)

##### **REGULATIONS (Aeroplanes)**

1.—Certificates for weight or passenger carrying will be delivered in respect of flights where each passenger carried must be at least 18 years of age and not less than 10 stone 3 lb. in weight.

2.—The carried weight shall comprise the weight of the Competitor, passengers (if any) and ballast, but shall not include fuel.

3.—The weight must be verified by an observer appointed by The Club, immediately before and after the flight, and all weighing must be done on Government tested machines, provided by the Competitor and approved by The Club.

4.—The attempt shall be for a minimum flight of 15 minutes.

5.—Entries must be made upon the Entry Form provided for the purpose, and must be accompanied by a remittance of £5 5s., the amount of the fee. The Entry Form, which must be duly filled up as regards the nature of the test and full particulars of the Aeroplane, must reach the Secretary at least seven days prior to the Trials.

*Should a further Certificate be desired for speed with a given weight, vertical speed with a given weight, or height with a given weight, the Regulations for the respective tests will be followed, in addition to the above, as far as applicable.*

#### **FLYING SERVICES FUND COMMITTEE**

A Meeting of the Flying Services Fund Committee was held on Wednesday, June 18, 1919, when there were present: Lieut.-Col. T. O'B. Hubbard, M.C., R.A.F., in the Chair, Mr. Chester Fox and Mr. Harold E. Perrin, Secretary.

**Grants and Allowances.**—The following Grants and Allowances were made:—

(27) A Grant of £5 to an Ex-Petty Officer in the Royal Naval Air Service who had been incapacitated on active service.

(51) An allowance of £2 a month for six months to the widow of a Sergeant in the Royal Flying Corps who had been killed on active service.

(73) An allowance of £2 a month for six months to the widow of a 3rd Class Air-Mechanic in the Royal Air Force who had been killed on active service.

(76) An allowance of £3 a month for six months to the father of a Corporal in the Royal Flying Corps who had been killed on active service.

(90) An allowance of £4 a month for six months to a 2nd Lieutenant in the Royal Flying Corps who had been incapacitated on active service.

(106) An allowance of £2 a month for six months to the widow of a 3rd Class Air-Mechanic in the Royal Flying Corps who had been killed on active service.

(111) An allowance of £1 10s. a month for six months to the widow of a Private in the Royal Flying Corps who had been killed on active service.

(112) A Grant of £20 to the widow of a 1st Class Air-Mechanic in the Royal Air Force who had been killed on active service.

(113) An allowance of £4 a month for six months to the widow of a Flight-Sergeant in the Royal Flying Corps who had been killed on active service.

(And a further thirteen, particulars of which will appear next week.)

Offices: THE ROYAL AERO CLUB,

3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

# DESIGN AND CONSTRUCTION OF FLYING BOATS\*

By Captain DAVID NICOLSON

## Introduction

DURING the War information regarding the progress in design and details of construction of aircraft was rigidly guarded by the Defence of the Realm Act regulations, consequently little has been published on the subject of flying-boat design or construction, and what follows may, to a certain extent, remedy the deficiency at least from the practical standpoint.

Within the limits of a paper it is not possible to treat the subject exhaustively, and I merely propose to deal mainly with the construction of the larger types of flying boats, known officially as F.2A, F.3, F.5, P.5, and N.4.

Of these, the F.2A has the smallest hull, which measures 42 ft. 6 ins. in length and 10 ft. in breadth, and is 2 ft. 6 ins. shorter than the F.3 and F.5 types.

The P.5 and N.4 types, patented by Major Linton Hope, are entirely different in design and construction from those above mentioned. Being of circular cross-section, with fair and easy lines, they offer much less air resistance, consequently with the same horse-power are driven at higher speeds; they are much stronger weight for weight than the F. type, more seaworthy, and generally show the impress of the trained naval architect's hand.

In comparison, the F. type follow more closely the aeroplane body, an attempt having been made to attach a flying-boat fore body to a fuselage tail. Compromises are seldom successful; the tail proved to be both weak and unseaworthy, and it was found necessary to strengthen it considerably by additional planking. As, however, this class was already slightly tail-heavy, the additional weight did not improve matters. Having rectangular sections, they were actually weaker in transverse strength than the Linton Hope circular design.

## Development of Flying-Boat Design and Construction

The first flying boat in the British service appears to have been the "Donnet Leveque," a French design, which was followed by the Sopwith bat-boat and the Curtiss small "America," which developed later into the White and Thompson and the Norman Thompson (N.T.2B) types.

A larger Curtiss boat, with twin engines, built in the United States, was in use for the North Sea patrol, and was probably the worst example of boat building that could be imagined, it having had no less than four consecutive planks butted—not even scarphed—on the same timber, which had a siding of only  $\frac{1}{8}$  inch, the line of butts being in line with the step, where the boat was naturally weakest.

Other early boats were the Saunders small "America," midway in size between the 24 ft. 6 ins. White and Thompson boat and the 33 ft. twin-engined Curtiss, the Nieuport, and the F.B.A. The two latter were of French design, and the last-mentioned was largely used for training purposes; in this respect also the N.T.2B has done excellent service.

The White and Thompson boats were built by Messrs. Saunders, of Cowes. These and other hulls were excellent examples of good work, but the system of their multi-skin-sewn construction proved inefficient, as the wire sewing, sunk flush with the surface of the outer skin, cut into the soft cedar when the boat was subjected to severe landing shocks, etc. Another source of trouble was the combination of a more or less flexible structure, with a series of rigid bulkheads, which did not prevent movement of the parts of the structure between them, with the result that distortion occurred, resulting in considerable damage.

The Curtiss boat, as originally built, was wall-sided, i.e., without projecting side fins to the front step and planing bottom, but as it experienced difficulty in getting off the water, the breadth of the step was increased by adding fins, thereby improving the planing efficiency, although the fins in service were very liable to damage.

A number of modifications of the Curtiss design were built at the Royal Naval Air Station, Felixstowe, to the plans of Col. Porte, who was responsible for the design of the first large flying boat, known as the "Porte Baby," which was built by Messrs. May, Harden and May. Although these "Porte Babies" were all constructed under the best conditions with respect to material and workmanship, they were inherently weak in the bottom, especially at the step, owing to the faulty design of the keel, which was of spruce, and very small in section at the tail.

American-built Curtiss boats of large size were later on imported in considerable numbers, but although the work-

manship and materials were much improved, they were still weak owing to a lack of continuity in the structural design, and frequent damages were reported, until Lieut.-Com. Hope-Vere (then in command of the Royal Naval Air Station at the Scillies, where these boats were kept afloat at moorings) stiffened up the bottoms with bent timbers and stringers. Boats of the F. type which followed were a great improvement on the Curtiss type, and were fitted with engines of considerably greater power, but, as in previous boats, the bottoms gave trouble owing to the faulty keel and floor construction.

While these various types of boats were being built at Felixstowe and in the United States, the 30 ft. A.D. boat was designed at the Admiralty, and a number of hulls were built. This was the first flying boat to be built on the system of resilient construction, and the hull proved to be extremely strong. Shortly afterwards, during the early summer of 1916, a 41 ft. boat was designed by Major Hope and a model tried in the William Froude Tank at the National Physical Laboratory, Teddington. The chief feature of this design, apart from form and light hull construction, was the much greater proportion of power to weight (15 lbs. per horse power) than in the existing boats, and there is little doubt that this boat would have given a performance far ahead of any existing boat or seaplane, with the exception of the little Sopwith "Schneider." Unfortunately, there was strong opposition to this design, and it was rejected in 1918. The "Phoenix Cork" was built to a somewhat similar but improved design on slightly increased dimensions, and proved very successful, being far ahead of anything previously accomplished.

## Construction. Type F.

The construction of the F. type is on the box-girder principle, with four longerons running right fore and aft. The keel, another fore and aft member, runs from the sternpost right round the nose to form the stem, and finishes at the gun ring. The keel and keelson combined with the floors form the backbone of the hull. That the keel is of faulty design is the opinion of the writer, for many boats were found to leak badly, partly due to the bad connection between the keel and bottom planking, and partly because the keel is too narrow. The keel and planking are fastened as in Fig. 1, but only one row of brass screws secure the bottom planking to the keel in the hulls of the F.3 type.

Another weak point is the discontinuity of transverse strength caused by running the timbers down to the keel and stopping them there, no provision really being made to hold the centre girder to the bottom planking or sides of the hull.

In the F.5 type the timbers are continuous from fin chine to fin chine, as in Fig. 2, forming a much stronger combination. The keel was increased in depth to  $1\frac{1}{8}$  ins., the width being kept the same, namely,  $2\frac{1}{2}$  ins. It would have been much better if the siding had been increased instead of the moulded depth. The bottom planking is again only fastened with one row of brass screws, which is insufficient. However, a great improvement was made by the continuous timbers, as they were through fastened to the keel by copper rivets.

**Keelson.**—The keelson is fastened to the keel in the F.3 boats by brass screws 18 ins. apart, but in the F.5 types the spacing is 9 ins., and the screws are hove up through bottom of the keel. Although the keelson in some parts measures nearly 12 ins. in depth, it is greatly weakened by having one-third of the depth cut out to accommodate the floors.

**Floors.**—It will be seen from Fig. 3 that two-thirds of the depth of the floor is cut away, thereby sacrificing strength to accommodate the keelson. A built-up floor, as in Fig. 4, would certainly be much more effective, and would be probably 40 per cent. lighter.

**Timbers.**—The timbers are of American rock elm,  $\frac{1}{2}$  in. by  $\frac{1}{2}$  in. spaced 4 ins. apart amidships, increasing to 7 ins. at the ends of the boat, and terminate at the lower chine; but it would have been an improvement had they been carried to the upper chine. The timbers are through fastened to the keel by copper rivets.

**Bottom Planking.**—This is arranged on the diagonal system, the inner skin being of cedar  $\frac{1}{8}$  in. thick at the ends and  $\frac{1}{4}$  in. thick amidships, fitted at an angle of  $45^\circ$  inclination to the keel. The outer skin is of mahogany,  $\frac{3}{8}$  in. thick forward,  $\frac{1}{2}$  in. thick amidships, and  $\frac{1}{4}$  inch thick aft, the planking being at an angle of  $30^\circ$ , with the forward end of the planks butting against the keel. This arrangement tends to diminish surface friction in wake of the seams. A layer of varnished fabric is fitted between the two skins, making the structure very strong. The planking is fastened

\* Paper read before Institution of Engineers and Shipbuilders in Scotland.



together with copper nails, and to the floors and stringers with brass screws. Along the keel and fin member it is connected with brass screws  $1\frac{1}{2}$  ins. apart.

In the earlier types of boats the planking was 5 ins. in breadth, with the rivets widely spaced, but it was found that

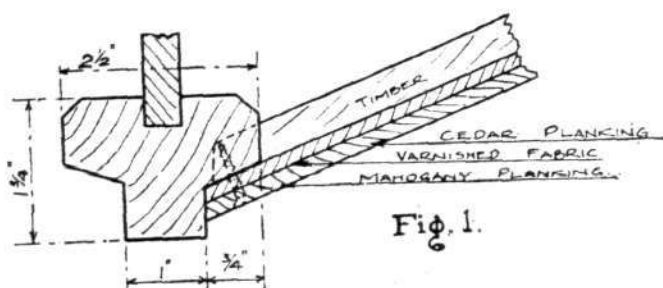


Fig. 1.

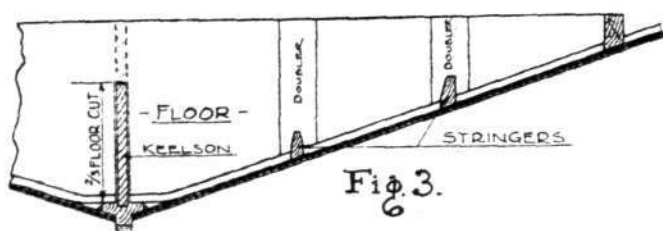
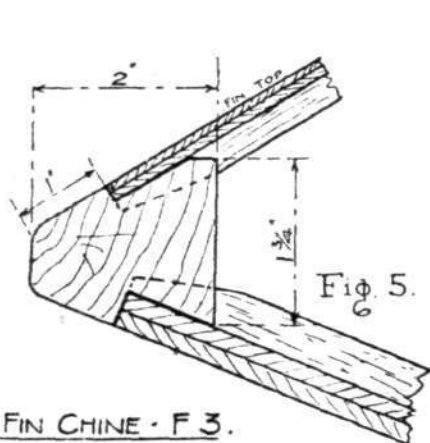


Fig. 3.

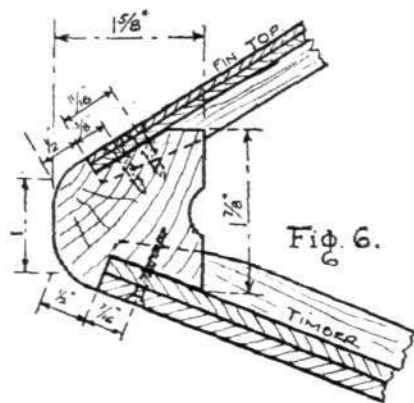
with this breadth the atmosphere affected such thin material, and opening of the seams resulted. The planking was afterwards cut down to  $3\frac{1}{2}$  ins. in breadth. It was also found necessary to keep the rivets very close to the edge of the planks, as there was a tendency for the planks to buckle. The bottom planking extends to the fin chine, which runs from the bow for fully two-thirds of the length of the boat.

Figs. 5 and 6 illustrate the connection of the planking with the fin chine in the earlier and later types of boats, and it will be seen that the back rabbet for the planking of the fin top and fin bottom is more workmanlike in the former than in the latter, which is less than 1 in. in length. By having only  $\frac{1}{2}$  in. of material between the ends of the fin chine and the planking, a boarding boat coming alongside might cause the planking to spring, as such a meagre allowance is inadequate to prevent an accident of this kind.

**Fin Top.**—The timbers under the fin for the early F.3 hulls were heavy and widely spaced, but in later boats timbers  $\frac{1}{2}$  in. by  $\frac{1}{4}$  in., spaced 2 ins. apart, were substituted to permit all-through fastenings of the diagonal planking on the hardwood timbers. It might also be stated here that the fin



FIN CHINE - F.3.



FIN CHINE - F.5.

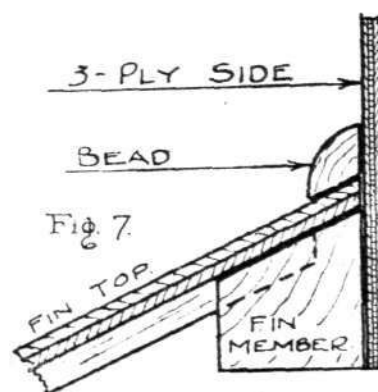


Fig. 7.

top of the first series of F. boats was of three-ply birch, and in later types was covered with fabric and varnished. The introduction of diagonal planking was a great improvement on this system. All the fins on the F.3 class are flat, but the F.5 types have a  $\frac{1}{4}$ -in. camber, which adds to the strength, gives a better appearance, and assists in getting rid of water easily.

**Stringers.**—Two stringers, equally spaced from the fin member, run under the fin, and other two stringers placed immediately below these on the bottom are connected by  $\frac{1}{2}$ -in. square posts spaced 1 ft. apart. Intermediate stringers, 16 ft. long, are introduced in the fore part of the boat further to strengthen the shell and to absorb shocks when the hull alights in the water.

**Fin Member.**—In the first boats of the F. type the fin member, Fig. 7, was of American rock elm. On account of improper connection between the side of the hull and the fin top, the longitudinal seam naturally opened up, so in later hulls the fin member was constructed as in Fig. 8, which has the member and bead in one.

This in turn might be improved by rabbeting out a piece at the back to allow the sides to house correctly, as in Fig. 9.

**Bow and Nose.**—The timbering at the bow is composed of rock elm,  $\frac{1}{2}$  in. by  $\frac{3}{4}$  in., spaced  $2\frac{1}{2}$ -in. centres apart, and reinforced by horizontal stiffeners below the top longerons.

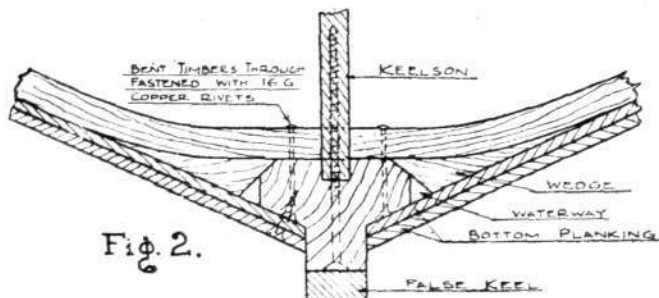


Fig. 2.

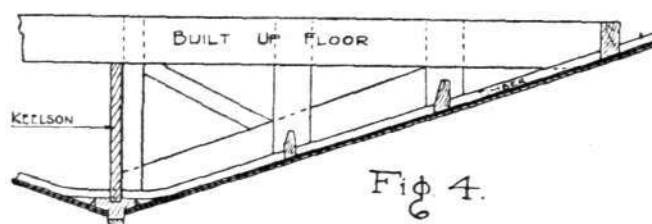


Fig. 4.

These are spaced to take the outer seams of planking, tapered towards the stem, and connected to the same by small oak breasthooks. These breasthooks bind the two sides of the bow together at the juncture of the stringer and stem, thus forming a very strong combination. Above the top longeron there are 10 deck-stringers, which are notched to take the ribs, together with three strong beams which subdivide the athwartship ribs. This skeleton, which is shaped like a dome, is planked diagonally, the inner skin being laid at  $45^\circ$ , with the forward ends of the planks lowermost. The outer skin is laid approximately fore and aft to suit the curve of nose. Each skin is of mahogany,  $\frac{3}{32}$  in. thick, the planking being fastened to strong beams with wood screws. Where stringers and ribs occur, copper nails are driven through and fastened on rooves on the inner skin; elsewhere the planks are fastened with copper nails spaced about 1 in. apart. This work, being well constructed, adds greatly to the appearance of the boat, and although the bow is slightly heavier than the rest of the hull, it is the best piece of construction in the whole boat. Strength at the nose or fore end of structure is very essential, for at high speeds the resistance of the

air is very great at this point, and a weak nose would be very easily damaged and driven in.

**Sides.**—Aft the bow planking, the sides are of three-ply birch, and extend from the bottom of the fin member to the top longeron, running aft to the gun-port openings, a distance of about 18 ft. The three-ply boards are butted against the side stanchions, thus saving buttstraps. Up to within a few months ago, the sides abaft the gun-port openings were built up of a narrow strip of mahogany, with fabric stretched between the same and the upper longeron. The fabric was not strong enough in anything like rough weather, nor under bad handling in fine weather, and the tails were weak in torsion; it was therefore superseded by diagonal planking of two skins, each  $\frac{1}{8}$  in. thick, with nainsook between. This planking was fastened to timbers, running from longeron to longeron, spaced 2 ins. apart, with one stringer midway running fore and aft. The new tail planking was a great improvement, although it added about 47 lbs. to the weight of the hull; but experience has justified the change and extra cost. Several of the latest hulls have the sides covered with

two-ply "consuta," made up of two pieces of very thin mahogany sewn together with flax thread, which is lighter than riveted work.

**Top of Hull.**—The transverse strength is made up of beams and arches combined with spruce stringers spaced about 7 ins. apart. The top of the hull has many openings, the foremost being a 30 $\frac{1}{2}$ -in. diameter gun ring; about 3 ft. abaft this there is the pilot's hatch, 4 ft. by 2 ft. 3 ins.; and 6 ft. further aft there is the wireless operator's hatch, 1 ft. 10 ins. in diameter. The engineer's hatch is placed on the port side, immediately abaft of which is a three-ply footway extending across the hull. About amidships there is a second

30 $\frac{1}{2}$ -in. diameter gun ring. Another opening accommodates the wireless mast, and lastly there is an 8-in. triangular ventilator.

Fig. 8.

FIN MEMBER &  
BEAD IN ONE.

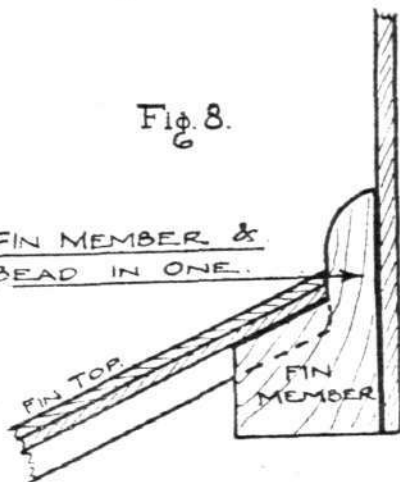
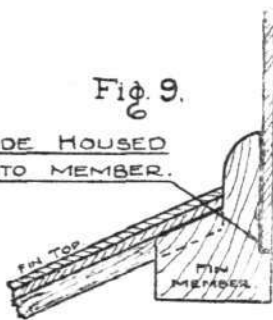


Fig. 9.

SIDE HOUSED  
INTO MEMBER.



The deck aft is built and covered with fabric, and the stringers decrease to a minimum, in order to keep the tail weight as low as possible. Naturally the longer and heavier the after part of the tail is the greater is the bending moment and tendency to shear, and as the extreme end has to carry the rudder elevators, etc., the designer aims at keeping down weight consistent with strength in this part of the structure.

**Bulkheads.**—These are four in number, each running from the top of the floors to a few inches above the top of the fin line. They are of  $\frac{3}{4}$ -in. three-ply birch, stiffened by diagonal spruce stiffeners. The top of the bulkhead is stiffened by a capping piece of spruce. Where a bulkhead came in line with a floor, it was necessary to fit a packing piece between the floor and the bulkhead, except amidships, where the keel is practically horizontal.

Where elevator control wires pass through a bulkhead a fabric stocking-joint with brass washer plates on each side keep the bulkhead watertight, and where centre bracing struts pass through, a three-ply watertight-collar is fitted.

**Metal Fittings.**—The chief elements of the structure, such as struts, pillars, beams, floors, wing-root spars, etc., are held and bound together by light metal fittings of about 16 B.W.G. steel.

The fittings were so numerous in the F. type that they had a considerable influence on production during the War, and, in consequence, they had to a great extent been eliminated in the P. and N. type, with the exception of the external stay tube plates and mooring eyes.

**Painting.**—The inside, as far up as the fin top and the end of the tail, is coated with bitumastic paint, while the remaining portions are well varnished.

The bottom outside is painted with a special flying-boat black anti-fouling composition. The first hulls constructed had the bottoms varnished, and when the third coat was still "tacky," black lead was rubbed in and the surface polished. This treatment proved excellent, but it involved a considerable amount of work at the air stations keeping the bottoms in good condition. Black lead was applied for the reason that, when the bottom was almost dry, it could be polished to the smoothness of glass, thereby greatly assisting the hull to get off the water when driven at high speeds.

As an experiment, one hull was covered on the bottom and fin top with velure paint, which gave satisfactory results, and it was found to be lighter than the covering of varnish and black lead.

The outside work not required to be painted, such as the nose planking, hatch coamings, three-ply work on the top-sides, top of fins, and the outside of the tail, receives three good coats of best varnish.

Two coats of black stove enamel are applied to all the steel fittings.

**Bracing.**—The *longerons* combined with the struts and stays form the principal superstructure of the hull above the fin top. From the nose to the gun-port openings these vertical and diagonal struts are of spruce, moulded to give the greatest strength with lightest section. Aft the gun-port opening

to the sternpost the vertical and horizontal struts are of 1-in. mild-steel tubes, braced diagonally fore and aft and transversely with 10 B.W.G. wire, all the wires being adjusted by turnbuckles.

The tail of the hull is not too stiff in torsion, so adjustment with the bracing wires must be carefully carried out, and all the turnbuckles locked. Occasionally tails get out of alignment in transit, a circumstance which causes a great deal of trouble when erecting the wings, tail fin, etc.

**Wing-root spars.**—The wing-root spars rank among the most important pieces of the structure. They not only carry the weight of the wings, but they support the engines. When in the air the hull is, so to speak, suspended from them; it is therefore most important that they should be of the finest and best material available. They are held in position at the sides and centre of the hull by heavy stanchions and struts. The centre bracing-struts are slotted, let over the keelson, to which they are bolted, the ends resting on the keel. This may not be considered good practice, as it compels concentration of thrust in a small local area, resulting in some cases to springing of the bottom planking and fastenings. Until quite recently all wing-root spars were of solid-section grade A silver spruce, but these are now laminated in two or three sections.

Outside the hull, and running fore and aft, six ribs of bass-wood, all equally spaced from the *longeron* to the end of the spar, further strengthen and help to keep the spars in place. These ribs have two small stringers passing through them, giving firmness to the structure, which in turn is covered on top with three-ply birch, and on the bottom, the fabric is stretched from the leading edge to the trailing edge, the whole forming the wing roots.

**Interior of Hull.**—The bottom deck is of sparred spruce-boards, varying in width from 3 ins. to 4 ins., screwed to the top of the floors.

At amidships, where the petrol tanks are stored, the floors are shaped to take the tank stools, and are specially stiffened and built up at the sides to form the tank cradles.

Accommodation for a gunner is located immediately below the fore gun-ring, and a table for his use extends from his seat to the nose of the hull. Underneath the table is carried an ammunition box and trays. The hinged seat, which has a high back, is made of three-ply wood, except the rails and supports.

Aft this seat is the station for the pilot and assistant pilot, so arranged as to give a proper lookout. Their seats are well upholstered with kapok cushions, which act as life-buoys if required. The assistant pilots' seat and back is made to hinge, so that a clear passage may be obtained for walking fore and aft. A few feet behind the pilot is the wireless cabinet, with operator's seat, while at the port side of this a ration box is fitted. The engineer's accommodation is situated aft, with a ladder giving access to the top deck. Further aft is the second gun-ring, with an adjustable platform, to allow a gunner to have a good range of heights above or below the gun-firing.

**Steps.**—The steps of the F.2A and F.3 boats are framed with ash bearers  $\frac{1}{2}$  in. thick, and are 3 ins. deep at the after edge, tapering to meet a board which runs off to a feather edge forward.

The bearers are spaced about 5 ins. apart, and through fastened to the bottom planking; where the timbers come in the way, they also take the fastening. The bearers are joggled to take the step timbers, which are of ash,  $\frac{3}{4}$  in. by  $\frac{1}{2}$  in., spaced about 2 ins. apart. The inner skin of the planking is of  $\frac{1}{2}$ -in. cedar, and the outer skin of mahogany of the same thickness, both laid diagonally. The whole step is constructed at the bench, fixed in place, and screwed on to the bearers.

At the forward edge of the steps a 6-in. copper band of light gauge covers the edge of the step, the forward edge of which is sunk into the bottom planking.

Trouble was experienced with the feather boards swelling, and in some cases coming away altogether, due to the "tearing" or frictional resistance of the water when the hulls were driven at great speeds just previous to their getting off. This was remedied in the F.5 boats by carrying the inner skin of the bottom right through from end to end of the boat. The outer skin abaft the back step was then put on and carried forward to a feather edge under the back step, while a short false inner skin was fitted over the usual step framing and then attached to the bottom skin. The outer skin between the steps was put on from the after end of the back step and worked forward to a feather edge under the main step with a false inner skin as before. The outer skin of the fore bottom was then carried right over this from the after side of the main step to the stem. This construction is much stronger, and a great improvement on the former step.

(To be concluded.)



## THE ROYAL AERONAUTICAL SOCIETY AT CRICKLEWOOD

THERE was a large gathering at the garden party given by the Royal Aeronautical Society at the Handley Page aerodrome at Cricklewood on Sunday last, and although the boisterous weather did its best to prevent passenger flights, the H.P. biplanes were more than equal to their task, and took up a large number of passengers, who thoroughly enjoyed their flights in spite of the "bumps." The visitors were received by the chairman and council in the large running-shed facing the aerodrome, and after an inspection of the Handley Page works, in which were seen a number of machines of the "small" as well as the large type, tea was served in the running-shed. Here also were on view a Handley Page twin-engined (Rolls-Royce) passenger biplane, recently finished, built to the order of the Chinese Government; one of the four-engined (Rolls-Royce) H.P.s, a Norman Thompson flying boat with Beardmore engine, and, by way of contrast, an old Caudron biplane with 50 h.p. Gnome engine. All these machines were inspected by the visitors, and later in the afternoon there was a very interesting lecture, given by Commander T. Y. Baker, R.N., and Maj. L. N. G. Filton, D.Sc., F.R.S., R.A.F., on "Navigation on a Transatlantic Flight."

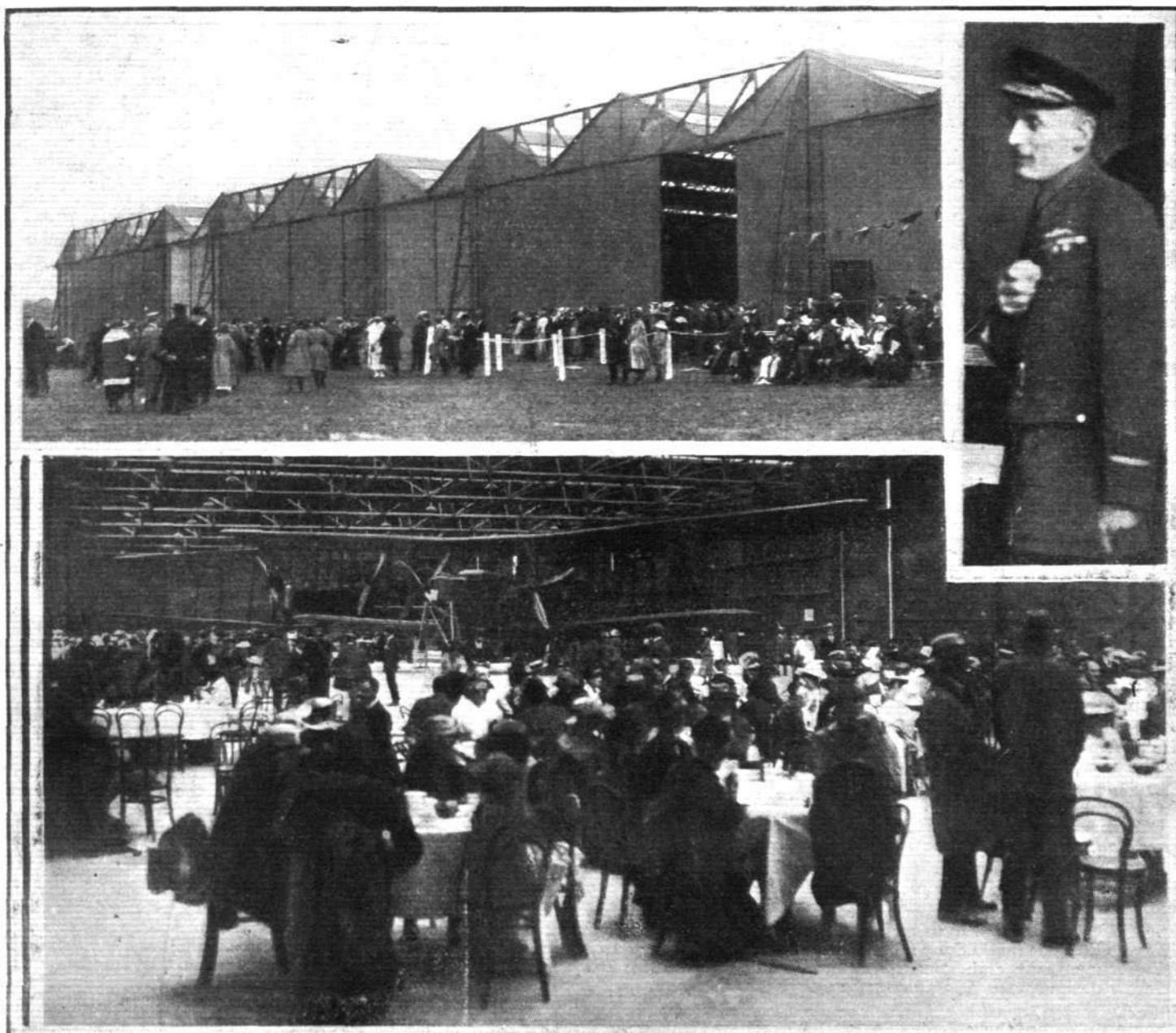
In another hangar the visitors enjoyed a technical exhibition prepared by the Technical and Research Departments of the Air Ministry, by permission of Brig.-Gen. H. R. M. Brooke-Popham, D.S.O. This exhibition included instruments of all descriptions, speaking-tubes for use on board

aircraft, wireless telephone and wireless telegraph outfits of different types and ranges, aero-cameras of all descriptions with specimens of some of the excellent photographs taken with them, and samples of British and German aero engines. The exhibition was highly instructive, and was greatly appreciated by the visitors.

The scientific nature of the exhibits in this hangar was relieved, later in the afternoon, by a very successful and well-attended concert given by the D.A.P. (Department of Aircraft Production) Quartette (Miss Agnes Goddard, Miss G. J. Gowrie, Capt. E. J. Webb, and Maj. A. H. Wood).

It had been intended to give demonstrations of parachute descents, but in view of the high wind which was blowing these were cancelled, and, we think, wisely so, since in such a gale it is extremely difficult to judge the right position for "jumping," with the consequence that the parachutist may easily land on some obstacle and sustain an injury.

In spite of these little variations in the programme, the visitors enjoyed themselves immensely, and all, we think, came away with the feeling of having spent a very interesting afternoon. Besides members of the Society, the guests included representatives of the Air Force and Air Ministry, the Chinese Ambassador, Gen. Squires, the American Air Force Chief, Maj.-Gen. Ruck, Maj.-Gen. Seely, Maj.-Gen. Sir H. M. Trenchard, Maj.-Gen. Sir F. H. Sykes, Maj.-Gen. Sir W. S. Brancker, Sir Robert Hadfield, Mr. Handley Page, and Mr. Holt Thomas.



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AT THE ROYAL AERONAUTICAL SOCIETY'S GARDEN PARTY, CRICKLEWOOD AERODROME.—  
(1) View of some guests watching flying. (2) Tea in running-shed. In the background, first passenger 'plane made for the Chinese Government. On the right, Brig.-Gen. Brooke-Popham inspecting the exhibits

# REAPPEARANCE OF THE REPORTS OF THE ADVISORY COMMITTEE FOR AERONAUTICS

DURING the War it has not been possible to publish the Annual Reports of the Advisory Committee for Aeronautics, for obvious reasons. The consequence has been that, although the chief designers of the various firms engaged on aircraft design and construction have had access to the valuable information contained in these reports, a great number of people directly and indirectly interested in aviation have been denied the benefit of access to the data obtained. We are glad to note that now, when the reasons for withholding general publication have disappeared, no time is being lost in issuing the reports. The first list of publications is printed below. The reports are placed on sale by H.M. Stationery Office, and it will be noted that each subject is issued, and may be purchased, separately, so that our readers will be able to get the subjects in which they are specially interested. As new publications become available, lists of them will be published in *FLIGHT*. The Memoranda number of each report, the date and the price are given in brackets at the end of each publication.

An estimation of the variation of the drag coefficient of a rigid airship form, from model size to full scale. By E. F. Relf, A.R.C.Sc. (No. 245, date May, 1916. 6d.)

The screening effect of airship screens and docks. By E. A. Griffiths and C. H. Powell, B.Sc. (252, July, 1916. 4d.)

The stability of airships, mathematical theory and illustrations of its use. By L. Bairstow, A.R.C.Sc., E. F. Relf, A.R.C.Sc., and J. L. Nayler, B.A. (257, June, 1916. 9d.)

The relation between the efficiency of a propeller and its speed of rotation. By L. Bairstow, A.R.C.Sc., A. Fage, A.R.C.Sc., and H. E. Collins. (259, May, 1916. 9d.)

A windmill to drive a wireless set of power one kilowatt. By A. Fage, A.R.C.Sc., and H. E. Collins. (261, October, 1916. 2d.)

Graphical solution of stability biquadratic. By R. G. Harris. Presented by the Superintendent, Royal Aircraft Factory. (262, September, 1916. 1s. 3d.)

The lateral stability of large kites. By J. L. Nayler, B.A. (263, September, 1916. 2d.)

Tests on five model airscrews and an experimental investigation of the interferences between these airscrews and a model of the end of the whirling arm at the Royal Aircraft Factory. By A. Fage, A.R.C.Sc., and H. E. Collins. (264, June, 1916. 9d.)

Test of a propeller with its axis of rotation at right angles to the wind direction. By E. F. Relf, A.R.C.Sc. (265, July, 1916. 3d.)

A method of measuring the speed of an aeroplane at a height. Central Flying School. (266, August, 1916. 3d.)

Notes on the performance of aeroplanes, based on a reduction of the observations made at the Central Flying School during the acceptance tests of aeroplanes. By L. Bairstow, A.R.C.Sc., F.R.S., E. F. Relf, A.R.C.Sc., and C. H. Powell, B.Sc. (268, February, 1917. 1s. 3d.)

An investigation of the strength of two airscrews for F.E. 2B. By A. Fage, A.R.C.Sc., and H. E. Collins. (279, October, 1916. 2d.)

Experiments on the possible rate at which a pilot can pull back the control column in an aeroplane. Royal Aircraft Factory. (282, July, 1916. 6d.)

Landing run of R.A.F. aeroplanes. Effect of increasing angle of incidence of wings. Presented by the Superintendent, Royal Aircraft Factory. (283, August, 1916. 1d.)

The velocity of the wind in front of the wing tips of an aeroplane in flight. Royal Aircraft Factory. (289, August, 1916. 3d.)

Drifting smoke. By A. M. Mallock, F.R.S. (299, October, 1916. 2d.)

Experiments with models of seaplane floats, 11th series. By G. S. Baker, M.Inst.N.A., and E. M. Keary. (300, December, 1916. 9d.)

On the testing of hydrogen for aeronautical purposes. By Guy Barr, B.A., D.Sc. (301, December, 1916. 2d.)

Experiments at high speeds, on six aerofoils suitable for airscrew design. By A. Fage, A.R.C.Sc., and H. E. Collins. (322, April, 1917. 6d.)

Some notes on the calculation of the working stresses of an airscrew. By A. Fage, A.R.C.Sc., and H. E. Collins. (420, March, 1918. 9d.)

Some experiments with tandem combinations of airscrews. By A. Fage, A.R.C.Sc., and H. E. Collins. (421, March, 1918. 9d.)

Some notes on floats for seaplanes of the single float type (14th series). By G. S. Baker, O.B.E., late R.C.N.C., M.Inst.N.A. (437, May, 1918. 6d.)

Dependence of the efficiency of an airscrew on the speed of rotation and the diameter with a direct reference to the question of engine gearing. By A. Fage, A.R.C.Sc., and H. E. Collins. (442, May, 1918. 9d.)

Strength test of main plane ribs. Method employed at the Royal Aircraft Establishment. By Wm. D. Douglas, A.R.C.Sc.I. Presented by the Director-General of Aircraft Production. (443, April, 1918. 9d.)

Exploration of the slipstream velocity in a pusher machine. By D. H. Pinsent. Presented by the Director-General of Aircraft Production. (444, April, 1918. 6d.)

Windage experiments with a model of the rotary engine, B.R. 1. By A. Fage, A.R.C.Sc., and H. E. Collins. (448, May, 1918. 9d.)

An empirical method for the prediction of wing characteristics from model tests. Compiled from existing experimental data. By E. F. Relf, A.R.C.Sc. (450, June, 1918. 9d.)

Critical loading of struts and structures. Part III. Vibration of spars under end thrusts. By W. L. Cowley, A.R.C.Sc., and H. Levy, M.A., B.Sc. (453, June, 1918. 3d.)

Second report on the twisting of propeller blades. (Supplementary to T. 1075.) By A. A. Griffith, M.Eng., and B. Hague, B.Sc., submitted by the Superintendent, Royal Aircraft Factory. (455, February, 1918. 4d.)

An analysis of the mutual interference of aeroplane bodies and airscrews. By A. Fage, A.R.C.Sc., and H. E. Collins. (458, June, 1918. 4d.)

The resistance of flying-boat hulls. By R. Jones, M.A., and G. N. Pell, B.Sc. (461, July, 1918. 6d.)

The variation of engine power with height. Presented by the Superintendent, Royal Aircraft Factory. (462, March, 1918. 9d.)

A comparison between two model aeroplanes differing only in plan form of wings, and the corresponding full-scale aeroplanes. By the Wind Channel Staff of the Royal Aircraft Establishment. Presented by the Controller, Technical Department, Aircraft Production. (463, July, 1918. 9d.)

The behaviour of the slipstream of a phugoid oscillation. By the Aerodynamics Staff of the Royal Aircraft Establishment. Presented by the Controller, Technical Department, Aircraft Production. (464, July, 1918. 2d.)

Tests of a model of the "Weasel" aeroplane body. By H. B. Irving, B.Sc. (465, June, 1918. 2d.)

Second order flexural stresses. By A. A. Griffith, M.Eng. Presented by the Director-General of Aircraft Production. (468, June, 1918. 3d.)

Report on measurement of accelerations on aeroplanes in flight. (Supplementary to R. and M. 376.) By G. F. C. Searle, Sc.D., F.R.S., and W. Cullimore, M.A. Presented by the Director-General of Aircraft Production. (469, June, 1918. 9d.)

Experiments with models of flying-boat hull. 16th Series. By G. S. Baker, O.B.E., late R.C.N.C., M.Inst.N.A., and E.M. Keary. (472, September, 1918. 4d.)

Experiments with full-sized machines. 1st Series. By G. S. Baker, O.B.E., and E. M. Keary, in conjunction with Capt. Gundry, R.A.F., and Lieut. Hackforth, R.A.F., of the Isle of Grain Experimental Station. (473, September, 1918. 6d.)

Report on the whirling of an airscrew shaft. By Arthur Berry. Presented by the Controller of the Technical Department, Aircraft Production. (477, August, 1918. 3d.)

Model tests on alternative bodies for an armoured aeroplane. (Pusher R.A.M. III.) By J. A. Carroll, of the Royal Aircraft Establishment. Presented by the Controller of the Technical Department, Aircraft Production. (478, July, 1918. 3d.)

Critical loading of struts and structures. Part IV. On the strength of a strut of variable flexural rigidity. By W. L. Cowley, A.R.C.Sc., and H. Levy, M.A., B.Sc. (484, September, 1918. 3d.)

Critical loading of struts and structures. Part V. On the whirling of a shaft of variable flexural rigidity. By W. L. Cowley, A.R.C.Sc., and H. Levy, M.A., B.Sc. (485, September, 1918. 2d.)

Investigation of the distribution of wind pressure over the body and the fins of a Caquot kite-balloon. By L. F. G.



Simmons, B.A., A.R.C.Sc., and R. A. Frazer, B.A., B.Sc. (479, August, 1918. 6d.)

Report on the tearing strength of fabrics and certain other materials. By A. J. Turner, B.A., B.Sc. Presented by Controller, Technical Department, Aircraft Production. (487, July, 1918. 1s. 3d.)

On the vibrations of a uniform rod rotating uniformly about one end, which is encastré. By Arthur Berry, Fellow of King's College, Cambridge. Presented by the Controller of the Technical Department, Aircraft Production. (488, September, 1918. 2d.)

Report on the protection of aeroplane fabric. By the Chemical Department, Royal Aircraft Factory. Presented by the Superintendent. (498, September, 1918. 3d.)

A report on high angle practice, to determine the wind at various heights for comparison with simultaneous determinations by pilot balloon ascents carried out at firing ground of H.M.S. *Excellent*, April 25 and 26, 1917. Presented by Sir Napier Shaw, F.R.S. (499, May, 1917. 3d.)

Records of temperature and altitude. By Flight-Comdr. Brian C. Clayton, R.N. Comments by Sir Napier Shaw, F.R.S. (501, May, 1917. 4d.)

Table of temperature, pressure and density at different levels up to 20 kilometres. Communicated by Sir Napier Shaw, F.R.S. (509, July, 1917. 1d.)

On a method of measuring rolling moments and aileron hinge moments on a model biplane. By H. B. Irving, B.Sc. (512, November, 1918. 6d.)

Variation of wind speed near the ground. Admiralty and Sir Napier Shaw, F.R.S. (531, March, 1918. 2d.)

Report on some formulæ for use in strut calculations. By A. A. Griffith, M.Eng. Presented by Controller, Technical

Department, Aircraft Production. (543, October, 1918. 2d.)

The approximate solution of linear differential equations. By A. A. Griffith, M.Eng. Presented by Controller, Technical Department, Aircraft Production. (545, October, 1918. 4d.)

Forces and moments on a model of S.E. 5, yawed, rolled and pitched in accordance with the instructions given in letter from Controller, Technical Department, September 14, 1918, Ref. 52659/APT. By L. W. Bryant, B.Sc., A.R.C.Sc. (546, October, 1918. 1d.)

Distribution of pressure over the tailplane of a De H.4 aeroplane. By the Aerodynamics Staff of the R.A.E. Presented by the Controller, Technical Department, Aircraft Production. (552, August, 1918. 1s. 6d.)

The whirling and whip of a revolving shaft. By Sir G. Greenhill. (560, December, 1918. 6d.)

Résumé of experimental work on air-cooled cylinders at the Royal Aircraft Establishment. By A. H. Gibson, D.Sc. Communicated by the Controller, Technical Department of Aircraft Production. (24, May, 1918. 1s. 6d.)

The expenditure of current and energy required for ignition in an explosion engine. Supplementing I.C.E. 190. By C. C. Paterson, M.I.E.E., and N. R. Campbell, Sc.D. (25, April, 1918. 3d.)

The existence of a "Time-lag" in the passage of the spark discharge. By C. C. Paterson, M.I.E.E., and N. R. Campbell, Sc.D. (26, May, 1918. 6d.)

The influence of the electrodes on the ignition of explosive mixtures by sparks. By N. R. Campbell, Sc.D. (27, June, 1918. 6d.)

The effect of capacity and shunt resistance on the peak voltage of a magneto. By C. C. Paterson, M.I.E.E., and N. R. Campbell, Sc.D. (29, February, 1918. 4d.)

## A VISIT TO THE NATIONAL PHYSICAL LABORATORY

IN the years before the War it was customary to invite a number of visitors down to Teddington to inspect the National Physical Laboratory and thus acquire a first-hand knowledge of the progress made in the research work carried out there. This visit generally took place in the month of June. Like so many other things this custom had to be suspended during the War, but it was revived on June 24 last, on the occasion of the annual inspection by the General Board, when a number of distinguished visitors had gathered to gain an idea of the nature and amount of work done at Teddington during the years that have lapsed since these visits have been in abeyance. The arrangements had been admirably superintended by Sir Richard T. Glazebrook, C.B., M.A., D.Sc., F.R.S., Director of the N.P.L., who, we regret to learn, is retiring in September. The reception was held in the new (and not yet completed) aeronautics building, and the visitors were then conducted to the various departments.

Of most direct interest to those concerned in aviation were naturally the aeronautics department, and the William Froude National Tank, although some of the other departments are also doing work very directly connected with the science of flying. In the Aeronautics department visitors had an opportunity of seeing actual tests being made in the old 3-ft. wind channel on a scale model of an S.S. Zero airship, the object of the tests being the determination of rotary derivatives. In the 4-ft. channel experiments were being conducted on the spinning of aeroplanes, the model being so mounted in the channel that as soon as the air current was started the model commenced to spin. In the 7-ft.

No. 1 wind channel was mounted a model of the keel of a rigid airship, with one of its engine cars, and experiments were being made on the mutual interference of airscrew and car, and on the flow in the neighbourhood of the airscrew. Experiments on balancing the rudders of an airship were being carried out in the 7-ft. No. 2 channel, while in the room containing this channel were to be seen models of complete machines for use in the wind channel tests, and a model of a very ingenious device for mooring rigid airships. As already mentioned, the new aeronautics building is not yet completed, but work is progressing there on, among other things, a new wind channel measuring 7 ft. in height and 14 ft. from side to side. When this channel is finished it will be possible to test very large models on which the effects of the airscrew slipstream can be represented.

In the Froude tank two sets of experiments were being made. One was on the resistance, running angle, and longitudinal stability of a seaplane float when planing on the water, and the other on the impact of a seaplane alighting on the water. In the Metallurgy department some interesting demonstrations were given of rolling high-tensile aluminium alloys down to a very thin section (about  $2\frac{1}{2}$  thousandths of an inch) suitable for covering the wings of aeroplanes. Of the experiments being carried out in the Physics department, and the apparatus employed, mention may be made of the Griffiths indicator showing at a distance the depth of petrol in the tanks of an aircraft. Finally, as it is obviously impossible to mention all the interesting experiments and demonstrations taking place, visitors were permitted to inspect the Paterson-Walsh electrical height indicator.

### Awards to Inventors

Any inventor who desires to present a claim to the Royal Commission on Awards to Inventors should submit brief details of his invention, stating whether it is protected by Letters Patent or not, and giving such reference to any correspondence that may have passed between him and the Department concerned as may enable his case to be traced.

The necessary forms of claim, together with full information as to procedure, will be forwarded to applicants by the Commission when it is clear that a substantial case for hearing by the Commission as a body has been made out, but every application for *ex gratia* remuneration must undergo a preliminary scrutiny by an investigating committee.

The address of the Commission is 2, Queen Anne's Gate Buildings, Westminster, S.W. 1.

### An Airship Club Dinner

THE Airship Officers' Club are holding a dinner at 7.45 p.m., on July 19, at the Connaught Rooms, Great Queen Street, W.C. This function is likely to mark another milestone in aeronautics. All who are interested and desire tickets, should communicate at once with the Secretary, Airship Officers' Club, 4, Dean Stanley Street, S.W. 1.

### Direction Finding by Wireless

An exhibit which will attract at the exhibition of British products, organised by the British Science Guild, is an apparatus for obtaining the bearing of a wireless station from an aeroplane while in flight, enabling an aviator both to navigate and to signal his approaching arrival or change of direction by wireless telegraph or telephone.

## CIVILIAN FLYING

### THE LONDON AERODROME AND AIR STATION, HENDON

COMING EVENTS FOR JULY.—Saturday, July 5, Hendon Peace Meeting. Sunday, July 6, special flying displays. July 12, Summer meeting. July 13, special flying displays. Several events are now in course of arrangement, and the dates of these will be announced later. These include Hendon-Birmingham-Manchester air race; Hendon-Paris-Hendon air race; Hendon-Brighton-Hendon air race. In addition, there are exhibition and passenger flights daily, and air races and special flying displays every Saturday and Sunday afternoon.

#### Peace Meeting, July 5

To celebrate the signing of Peace, a special air race meeting will be held at the London Aerodrome, Hendon, on Saturday next, July 5, when the programme will include a speed contest round the aerodrome pylon course (the first since the pre-War period). The race, which will commence at 4 p.m., will be run in two heats of four laps each, and a final heat of six laps.

The prizes include the London Aerodrome "Peace Trophy," presented by the directors.

The entrants include:—

1. Lieut. C. Turner, A.F.C., on B.A.T. (170 A.B.C. "Wasp").
2. Capt. P. R. T. Chamberlayne, Grahame-White "Bantam" (80 Le Rhone).
3. Maj. C. Draper, D.S.O., B.A.T. (Special "Bantam") (170 A.B.C. "Wasp").

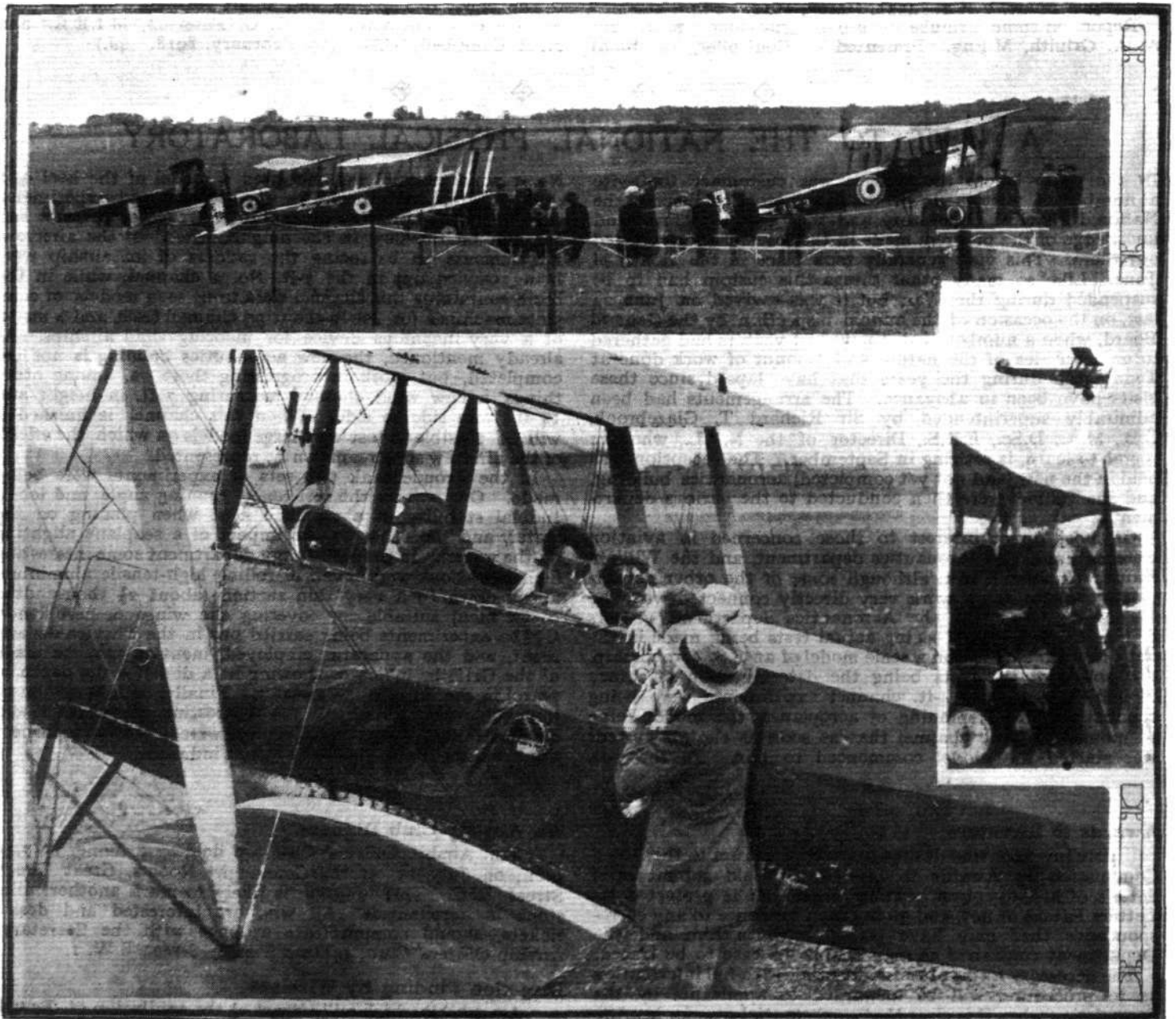
5. Maj. R. H. Carr, A.F.C., D.C.M., Grahame-White "Bantam" (80 Le Rhone).
12. Maj. C. H. C. Smith, D.S.C., Bristol monoplane (110 Le Rhone).
19. Capt. D. H. Robertson, A.F.C., Avro (110 Le Rhone).
20. Lieut. G. R. Hicks, D.F.C., Avro (110 Le Rhone).

It is expected that Mr. Prodger will take part in the contest, and also Capt. G. Gathergood, A.F.C., who will probably use the same machine on which he won the Aerial Derby. The usual passenger and exhibition flights will also take place on this, and the following (Sunday) afternoon.

### NORTHOLT AERODROME

YET another civilian aerodrome was opened to the public last Saturday afternoon when the Central Aircraft Co. started work, at their new aerodrome at Northolt, catering for the ever-increasing demand from the public for joy flips. On this first occasion two and three-seater Avro biplanes, with 110 h.p. Le Rhone engines, were in commission, piloted by Mr. Herbert Sykes and Lieut. Castleman. It is hoped that some of the "C.A.C." buses (designed by Mr. Fletcher), including the twin-engine eight-seater, will be added to the flying stock by next week.

The weather on Saturday was by no means ideal, it being overcast and very windy, but in spite of this both Sykes and Castleman were kept quite busy taking up visitors for flights until well into the evening. Many of these passengers consisted of American soldiers and sailors, a large party



"Flight" Copyright.

THE OPENING OF THE CENTRAL AIRCRAFT AERODROME AT NORTHOLT ON SATURDAY.—A quartette of the Avros used for passenger flying. "Au revoir" to baby by two passengers taking a flight with Lieut. Castleman, and, on right, Mr. Sykes returning from an exhibition of stunting on an Avro.



having come to the aerodrome for an outing. An interested—if at times somewhat critical—spectator was Mr. Fletcher, jun., who, by the way, can now manage to do straights without instructor with comparatively few bad landings.

Sykes handled his Avro very skilfully, making perfect landings on the same corner of the cinder patch every time, in spite of the exceedingly bumpy wind and the fact that the Avro is a comparatively strange machine to him.



### No Flying Through Tower Bridge

THE Air Ministry notifies for the information of all pilots that the practice of flying through the Tower Bridge between the high level footways and the bascules must cease. Any such cases reported in future will be severely dealt with.

### The M.O.M. and Aeroplane Output

In his speech in the House of Commons on June 24 introducing the Ministry of Munitions Vote, Mr. Kellaway said that at the outbreak of War the British Army had in its possession about 100 aeroplanes. The Ministry became responsible for aeroplane production on September 12, 1917, when the production had increased to 500 aeroplanes per month. At the date of the Armistice—a little more than 18 months later—production had been increased to 4,000 per month. At a time when raw material and machinery was very largely engaged on other essential war production this country was able, thanks to the ingenuity of its craftsmen and the farsightedness of its captains of industry, to make so great a step forward in its aircraft production as that, and the improvement in the fighting quality and the safety of the machines was just as great as the increase in the numbers. There was no question amongst informed men that during the latter stages of the War this country held the supremacy over her enemy in the air. That was due not only to the extraordinary fighting spirit and ingenuity of the men who flew and fought the machines, but also to the ingenuity and patriotism of the craftsmen and the employers engaged in that great industry.

### And Why the Raids Stopped

LATER in his speech, in alluding to some criticisms of Ministry of Munitions methods, he alluded to anti-aircraft bullets. He showed sections of half a dozen bullets. The first, he said, was indistinguishable from the bullet that the infantryman fired out of his rifle. Another was one which, to the layman, did not differ on casual examination from the first, but that bullet (the sixth) was used only once, on Whit-Sunday of last year, and prevented any further air-raids on this country. Were we right to scrap the earlier bullets when we found a better one? Were we not right to stop the contract for the earlier bullet and to pay compensation to the contractors? He would not have liked to have been the Minister to stand up in that House on one of those nights when London was being raided, and, when questioned as to whether we had not a bullet to stop the raids, to have said, "Yes, it is true, but the contractor is engaged turning out the earlier form of bullet, and we must not turn him off that in order to make the new bullets, otherwise the Comptroller and Auditor-General, the Public Accounts Committee and the Press will denounce the Department as being wasteful muddlers." On the day after Whit-Sunday last year it was known that Germany had prepared for air raids on this country, by heavier-than-air machines, greater in magnitude than had ever been attempted before. Why did they not come? They did not come because the reception that their airmen got that Sunday night made it impossible to get men to face such risks. On the mere ground of money alone, if that ground is taken, then on these contracts the Department can claim to have acted justly and properly in the action which it has taken.

### Aerial Derby Notes

FROM an inspection of the Timekeeper's table for the Aerial Derby, flown on June 21 last, the following points, which we think are of interest, are elicited:—

The times made for each lap by individual competitors were very consistent, proving that in each case a good course was flown. The only exceptions were Capt. Gathergood (No. 7) and Lieut.-Col. Henderson (No. 4). The former increased his speed of 126.42 m.p.h. for the first lap, to 132.34 m.p.h. for the second. His average speed for the total distance of two circuits was 129.38 m.p.h. The latter was compelled to make a temporary landing at Hounslow on his second round for adjustments, which explains the discrepancy in his lap times; but for this he would probably have come near to winning the sealed handicap. The fastest lap was made by Capt. Gathergood, viz., 42 mins. 50½ secs. The average speeds stated above are, of course, equivalent to considerably greater speeds on the straight and in calm

Castleman is undoubtedly an expert on the Avro, and prior to his taking up passengers, he gave us a wonderful display of stunting, including three-minute "hovers."

Northolt aerodrome is easily got at, either from Ruislip, on the Metropolitan Railway, or from Northolt Junction, on the G.C. Railway (Marylebone) and G.W.R. (Paddington), the aerodrome being only a few minutes' walk from either station.



air. The turning points reported that, with one or two exceptions, all competitors flew low and close.

Having regard to the great disparity in the speeds of the competitors, which ranged from 70 to 133 miles per hour, the handicapping must be adjudged a good one. It will be seen from the handicap times set forth in last week's issue, that only 17 minutes separated the first and last of the seven machines which completed the course, and less than five minutes separated the second and sixth. Maj. J. H. Ledebour and Mr. C. T. Glazebrook, the official handicappers, are, therefore, certainly to be congratulated on their work.

No prize was offered for the fastest time third place, but we understand that a special trophy will be presented to Mr. Manton for this by the Grahame-White Co., Ltd.

The London Aerodrome silver medal will also be presented to all pilots (except prize-winners) completing the course, and the London Aerodrome bronze souvenir medal to all pilots who started but did not finish.]

### Royal Society of Arts Silver Medal

AMONGST the recipients of the silver medal of the Royal Society of Arts for papers read during the past session are:—

Sir Frank Heath, K.C.B., Secretary, Department of Scientific and Industrial Research, for his paper "The Government and the Organisation of Scientific Research."

Walter Leonard Lorkin, A.M.I.E.E., "Electric Welding and its Applications."

W. Norman Boase, C.B.E., "Flax—Cultivation, Preparation, Spinning, and Weaving."

Brig.-Gen. Lord Montagu of Beaulieu, C.S.I., "Aviation as Affecting India."

### The London Air-Raids

In an interesting address given by Col. H. de Watteville to members of the London Topographical Society at Burlington House, last Friday, a little further light was let in upon the past happenings. Col. de Watteville, after remarking that the Zeppelins were far from being an unqualified success, said: "For every ship that got to these shores, you may be sure that there was an accident somewhere in Germany. During the War no fewer than 120 of these enormous airships were built, and yet there were never at any time more than 15 or 16 that were fit to take the air."

"Wireless telegraphy played a very considerable part in the navigation of these ships over the water. We discovered this in 1915, and made full use of it. The actual apparatus had better not be described, but I can assure you that some of us in London actually knew half-an-hour before a ship left the sheds in Germany that a raid was coming to these shores."

The long record of raids over London was one, from the German point of view, of comparative failure. The bringing down of the Zeppelin at Cuffley by Capt. Lee Robinson proved the turning-point in the airship campaign against England. It was witnessed by ten other raiders, and the sight of the burning ship dropping to the earth was too much for them. Col. de Watteville repudiated the suggestion that the amount of damage done in these raids was suppressed. "Our *communiqués* of the damage done by the airship raids were absolutely correct," he said. "Every single casualty and every single bit of damage that was done by a German raider throughout the War was recorded."

### Advertising Victory Loan from Aircraft

In order to assist the progress of the Victory Loan it has been decided to allow commercial or private aeroplanes, flying over the British Isles, to drop, subject to the under-mentioned condition, small discs of paper, advertising the loan, on the towns or country over which they are passing.

Clause 2 (d) of Regulation 5 of the Air Navigation Regulations, 1919, will not apply to aircraft engaged on this special work provided that any companies or other owners of aircraft willing to undertake the work act on the instructions of the Secretary, National War Savings Committee, Salisbury House, Salisbury Square, E.C. 4, from whom all further information can be obtained.

Unless this condition is complied with, action will be taken in accordance with Regulation 10 (1) of the Air Navigation Regulations, 1919.

# AN R.A.F. ENGINE HOSPITAL

BY CAPTAIN L. A. RUSHBROOKE

THE aero engine is a delicate mass of mechanism. Built to stand great stresses, it yet needs constant skilled attention, for running at the enormous speeds it does, the least play in a bearing, the smallest flaw, develops in a few moments into a serious breakdown.

There is an ominous ring about the phrase "engine failure." In the early days engine trouble was looked upon as more or less inevitable, and was of frequent occurrence. Gradually, however, the toll of losses due to this cause has been reduced almost to a minimum. The most scientific organisation, the most skilled technical knowledge, have been devoted by the R.A.F. to the perfecting of the engines used in the Force, thus ensuring that, so far as human foresight can prevent it, no lives shall be needlessly lost on this score.

A visit to the R.A.F. engine repair shops in France enables one to realise the complexity of the organisation necessary to keep in repair the engines required for the vast number of aeroplanes which were operating at the close of hostilities, and the minute care which is lavished upon every detail of the work.

The story of the growth of these engine shops is a fascinating record of steady progress. The parent of the depôt was No. 1 Aircraft Park, which closely followed the first five squadrons to France in 1914. After frequent moves during the early months of the War, including a 24-hours stay at Amiens from which a rapid retirement was necessary, No. 1 A.P. settled for a time near Rouen.

When the line became stabilised, the A.P. went forward, leaving behind the engine workshop section, consisting of 50 men and two officers. This section then became an independent unit and was re-named the engine repair shops, and took up its quarters in a nearly completed boot factory.

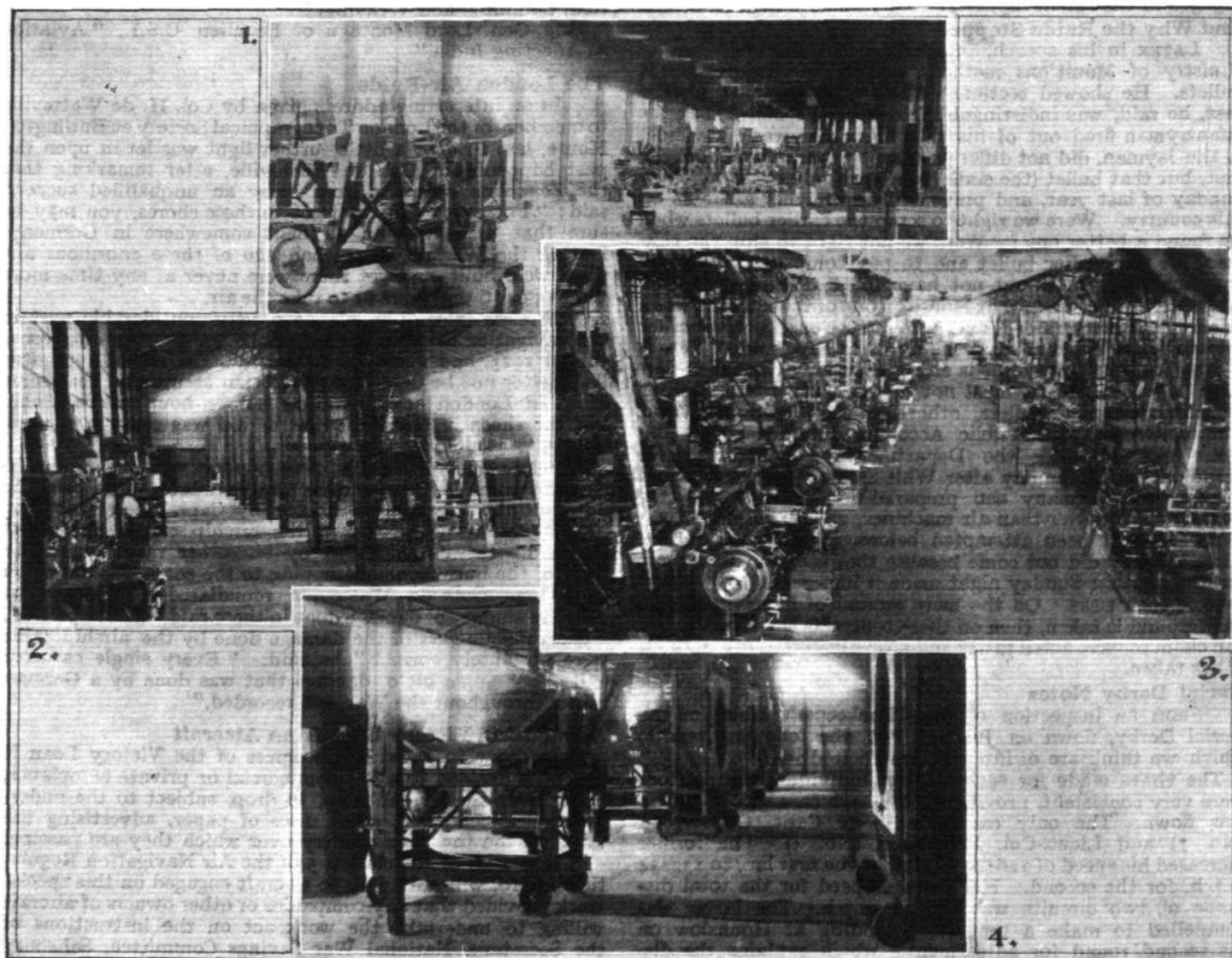
This factory, which previously housed the whole staff of 50, is now merely the fitting and machine shop with a staff of 800 men.

As the number of squadrons in the field increased, the E.R.S. grew proportionately. In May, 1915, the section dealing with motor transport engines was detached. More ground was taken over, new sheds erected, new plant sent from England, and installed. The establishment was doubled, re-doubled and doubled again, until on November 11 the total staff numbered nearly 5,000, including 90 officers. Moreover, to keep pace with the work it was necessary to work continuously with day and night shifts. In 1914 all the power necessary was supplied by one small kilowatt set. In November, 1918, the power station contained four 100 h.p. and one 20 h.p. Petter oil engines generating 400 kilowatts. An interesting feature of the E.R.S. is that since its earliest days it has been under the continuous command of the same officer—Col. G. Hynes, D.S.O., who has been responsible for the wonderful organisation now existing.

War flying is inevitably wasteful. The expenditure of engines is great. With over 1,500 machines in the field, hundreds of engine casualties occurred every month. In the R.A.F. the number of hours flying which any engine is allowed to make without complete overhaul is strictly limited. No risks are taken. As soon as the time limit is reached the engine is returned to the E.R.S. for overhaul.

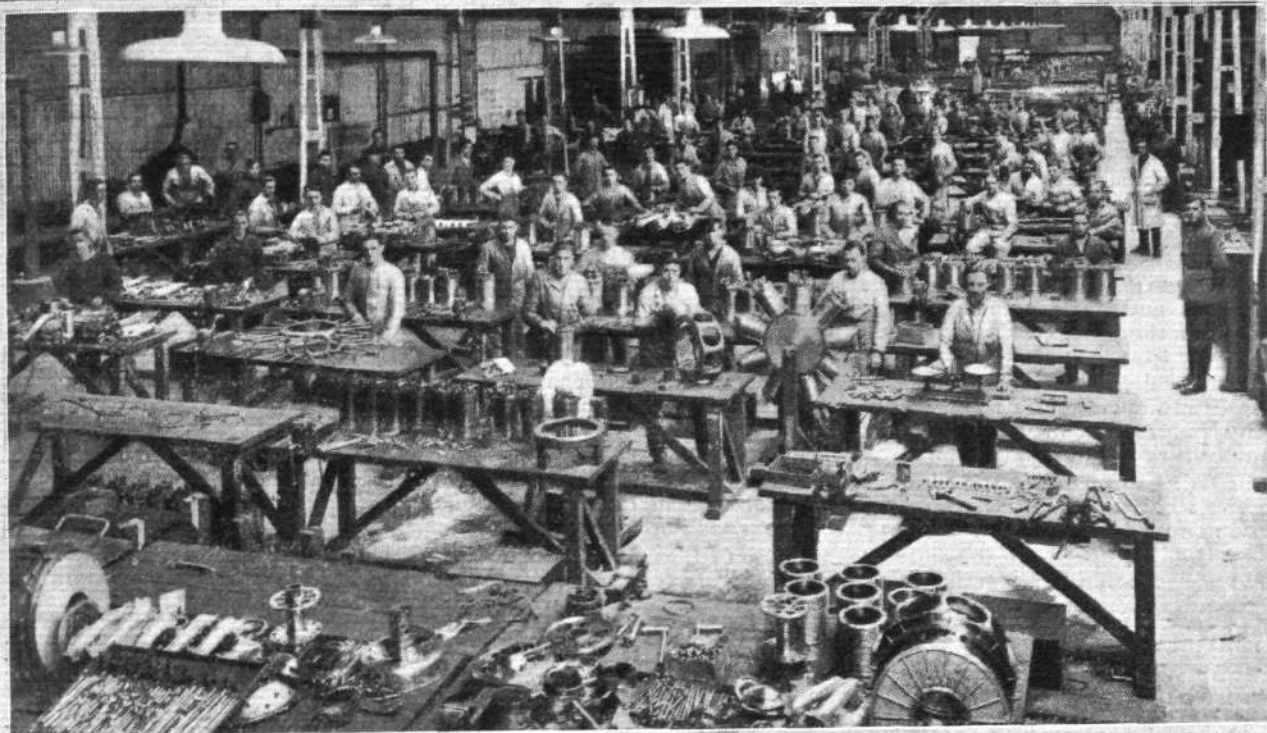
Then there are the crashed engines. Apparently hopeless wrecks reach the shops and in a few weeks' time emerge as perfect as ever.

The division of the depôt is into six main groups, the first three dealing with different types of engines, and the last three with sub-division of the work.



AN ENGINE REPAIR SHOP IN FRANCE.—1. The testing shed. 2. Engines under propeller test. 3. One of the machine shops. 4. Engines running in wind brake test.

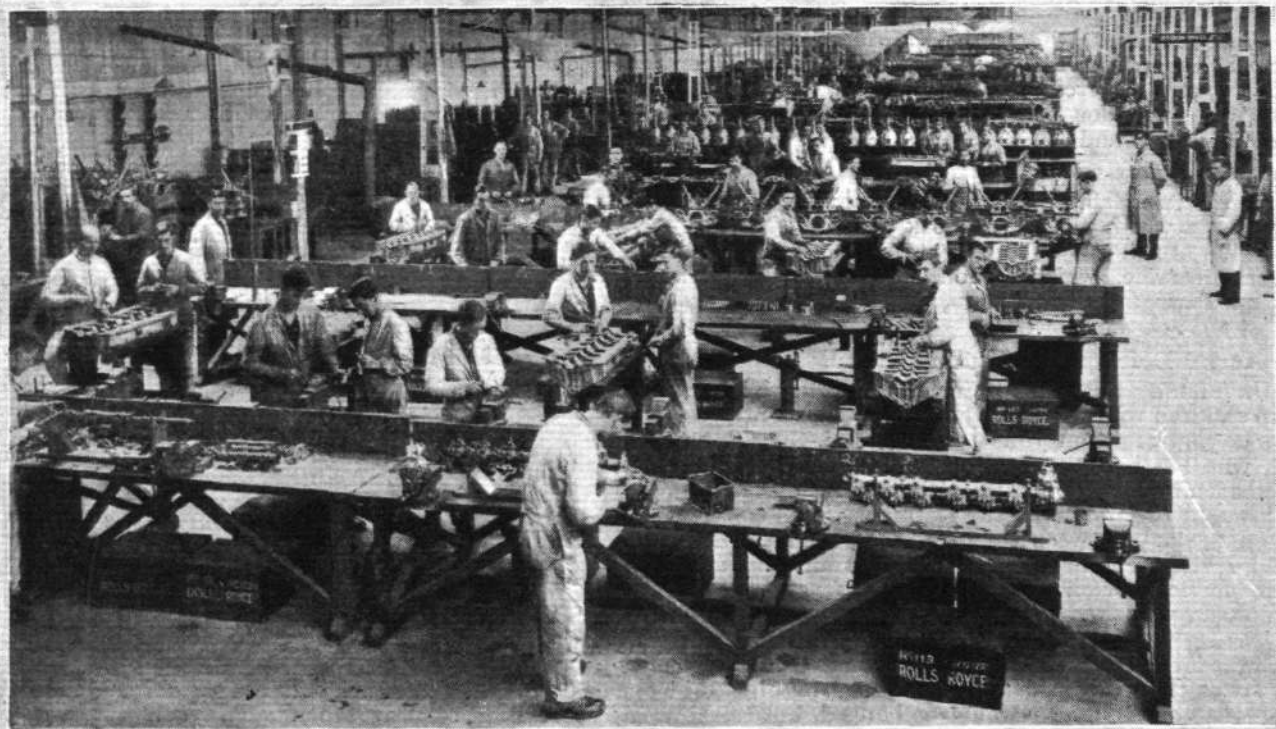




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AN ENGINE REPAIR SHOP IN FRANCE.—1. Repair shops. 2. Cylinder shop. Rotary engines.  
3. Rolls-Royce erecting shop.

1. Rolls-Royce, Beardmores and Liberties.
  2. Hispano-Suiza direct drive, Le Rhone, Clerget and B.R. 1 and 2.
  3. The 220 geared Hispano-Suiza.
  4. Machine shops, tool shop, fitters, gas plant and heat treatment, chemical laboratories and rest room.
  5. Pumps, magnetos and carburettors, electricians, foundry, power house, tin and copper welders, carpenters and painters.
  6. Stores, motor transport, O.M., drawing office and H.Q.
- The procedure is the same in each engine group. Every engine on receipt from the unpacking shed is sent to its respective group.

It is then completely stripped and each part washed and examined. Faulty parts are sent to their particular subdivisions for repair and replacement. The various parts are then collected in the erection shops. This, by the way, is one of the longest jobs. In the Rolls-Royce engine there are over 3,000 parts, while 2,000 may be taken as a fair average for all types. Minute accuracy is required to eliminate all play, and many parts after being trued on machines to  $\frac{1}{1000}$  in. are finally scraped by hand. The work of erection takes two men from 14 to 21 days for each machine.

After rebuilding, the engine is passed to the tuning shop and thence to the test house. After running for an hour on the brake test it is returned to the finishing section of the erection shops, re-examined by the inspection depôt,

packed and re-issued to an aircraft depôt for supply to squadrons.

Although absolutely no precaution is neglected or trouble or necessary expense spared to ensure faultless running, typical economies are introduced whenever possible. For instance, all gas for the various heat treatments, etc., is generated in a special plant from waste oil and petrol. Scrapped iron is melted down in the foundry and re-cast. White metal for bearings is also melted down and cast into ingots for refuse, but this babbit metal is never used twice for aero engines. The ingots are passed on to the base depôt for M.T. use there. Perhaps an unnecessary precaution—since it has not been conclusively proved that babbit metal suffers by re-casting—but where lives may depend upon such details the R.A.F. takes no chance.

An interesting feature is the indicator board in the chief engineer's office, which tells at a glance how many engines are under repair, where each one is and how many are ready for issue. Another board in the production office keeps track of every job which comes to the shop apart from the actual engine repairs—such as orders for spare parts, etc.

One thing strikes one forcibly, that it has been possible to build up—under all the difficulties of active service—an organisation rivalling in efficiency the most modern shops laid down under peace time conditions at home. It is an achievement of which the R.A.F. may well be proud.

## HONOURS

THE King has been pleased to give orders for the following promotion in and appointment to the Most Excellent Order of the British Empire, in recognition of the services of the following officers during the War:—

O.B.E.

Lieut. H. J. WAGG, R.N.V.R.—For valuable services as Second in Command of the Anti-Aircraft Telephone Staff at General Headquarters, Great Britain.

M.B.E.

Shipwt. Lieut. A. C. SMITH, R.N.—For valuable services as Barrack Master, Cranwell Air Station.

The King has been pleased to approve of the following award to the following officer in recognition of his gallantry and devotion to duty in the field:—

D.S.O.

Lieut. H. O. LONG, No. 3 Sqdn., R.F.C. now R.A.F.—For most conspicuous gallantry and ability during June and July, 1916. He initiated low-flying attacks on troops, transport, and trains far beyond the enemy lines. He also brought down several enemy aeroplanes. These flights were carried out alone and unescorted. He did splendid work.

### The "Atlantic" Knights

IN last Friday's *Gazette*, formal announcement was made of the knighthoods of the Order of the British Empire conferred on Capt. John William Alcock, D.S.C., late R.A.F., and Lieut. Arthur Whitten Brown, late R.A.F., "in recognition of distinguished services to aviation in connection with the successful flight from St. John's, Newfoundland, to Clifden, Co. Galway, on June 14-15, 1919."

### "N.C. 4" Pilots Arrive Home

UPON the return to the United States on the transport *Zeppelin*, of Commander Read and the other American Atlantic flyers on June 27, arrangements were made for the vessel to be met and escorted into harbour by aeroplanes and airships. The reception programme had to be much modified by reason of rain and mist.

### Atlantic Vickers-Rolls for Holland

AT the Air Exhibition at Amsterdam the Vickers-Rolls aeroplane in which Sir John Alcock and Sir Whitten Brown made their crossing is to be on view. During the exhibition an aerial service, which is to be maintained afterwards, between Paris and Amsterdam, should do much to keep interest alive in the show.

### The Aerial Defence of London

UNVEILING at Poplar on June 23 a memorial erected to the 18 children who were killed in Upper North Street school in the daylight raid on June 13, 1917, Maj.-Gen. E. B. Ashmore, who has had charge of the aerial defence of London, said that after the last raid, although he did not like to prophesy, he did not think the Germans would try to get to London again. Between May 19, 1918, and the Armistice he had devised a new system of defence, four times as strong as the previous defences. After the defences were started two more day raids were made with a view to reaching London. One was stopped at Southend, and the other at Ramsgate, and at the latter place the guns shot down two of the raiders.

So far as the night raids were concerned, he himself at one time looked as though he would be hanged, but the Government spared nothing in the way of guns and searchlights. London, however, owed its defence more particularly to the gallant boys who flew by night, and so splendidly did they

do their work that two squadrons were made up to do night bombing work over the lines in France.

The balloon aprons which were erected in certain localities were also found very serviceable. Accordingly on May 19, 1918, when seven machines were brought down, this finally decided the Huns and they left London alone and turned their attention to Paris, which they afterwards raided 16 times.

### From Plymouth to Buenos Aires

THREE flying men from South America, Capt. Angel M. Zuloaga (commander), Capt. Annibal Briguega (navigator), and Eng. Ambrosio Taravella (mechanic), are visiting London with a view to completing preparations for a flight from Plymouth to Buenos Aires via Portugal and Africa, some 8,000 miles, the Atlantic crossing, representing about 1,500 miles.

The flight may be made in an F 5 flying boat if one can be purchased from the British Government.

### Roses Dropped by Parachute

AMONG the many gifts received by Queen Alexandra one which gave her great pleasure was a bouquet of Alexandra roses brought to her in a decorated car from Hyde Park, where it had been dropped, by means of a Guardian Angel parachute, from a Handley Page bombing machine piloted by Lieut.-Col. W. S. Douglas, M.C., D.F.C. Through her private secretary Queen Alexandra sent the following telegram to Messrs. Handley Page: "Queen Alexandra wishes me to thank you for the beautiful bouquet of roses which you have so kindly sent her, and which Her Majesty is interested to know was dropped in a parachute in Hyde Park and despatched to her by car. Queen Alexandra was pleased to see the splendid aeroplane circling round Marlborough House this morning."

### Milan-Venice Airship Service

IT is reported from Milan that the airship service between Milan and Venice has been inaugurated. The dirigible "F.6" left Buggio, near Milan, with 30 passengers on board, on June 23, while at about the same time the "N. 14" left Campalte, near Venice, carrying 20 passengers. Both airships are said to have made the journey successfully.



## AIRISMS FROM THE FOUR WINDS

ANOTHER historical fact to be recorded for all time to the credit of aeronautical progress is the sending on Saturday, from Paris to London, by aeroplane—an Airco 4A—the Prime Minister's message to King George announcing the signature of the Peace Treaty. It was written at 4 p.m., in the Salle des Glaces, on the plain Congress notepaper. According to *The Londoner*, at 5.15 Mr. Bonar Law and Mr. J. C. Davidson, carrying the message, went up at Le Buc. In spite of head winds and a rough passage, they were—thanks to the skill of their pilot, Lieutenant Powell—at Kenley at 7.30. From Kenley Mr. Bonar Law and Mr. Davidson drove in a car to Downing Street. Mr. Davidson then continued his journey alone through the crowds to the Palace, which was reached at 8.25. At 8.30 the message was handed to His Majesty, who questioned Mr. Davidson with much interest on the details of this speedy and interesting flight.

KING ALBERT OF BELGIUM has throughout the War, in which he took so active a part, shown increasing interest in the aeroplane as an everyday means of travel. He has now, according to the *African World*, marked the same keen sense of future success in the air by providing a special fund of £80,000 for the purchase of 15 seaplanes of different types as an experimental mail and passenger service in connection with the opening up of the Congo.

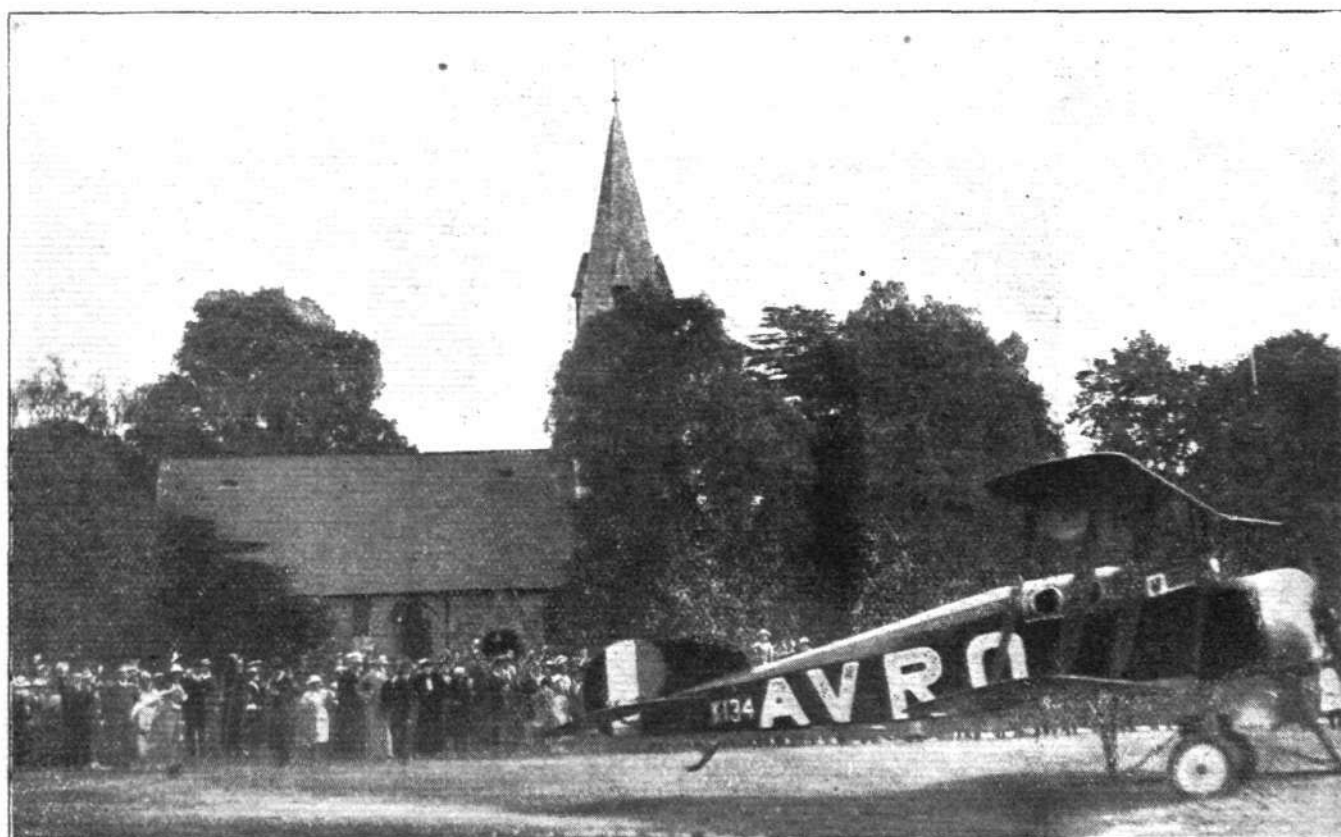
It was a pretty idea for the one and only "flag-day"—Rose-Day—which the public are now inclined to willingly tolerate, to be marked by the dropping of a magnificent "aerial" bouquet from a Handley Page for presentation to Queen Alexandra. Quite an elaborate scheme with rose bouquets attached to aeroplanes had been worked out in connection with Marlborough House, but this had to be abandoned, and the promoters rest content with dropping one for the Queen in Hyde Park, whence it was conveyed to Marlborough House by motor car.

It is, however, a far cry from a graceful little tribute like this to sending choice specimen flowers by plane for exhibition

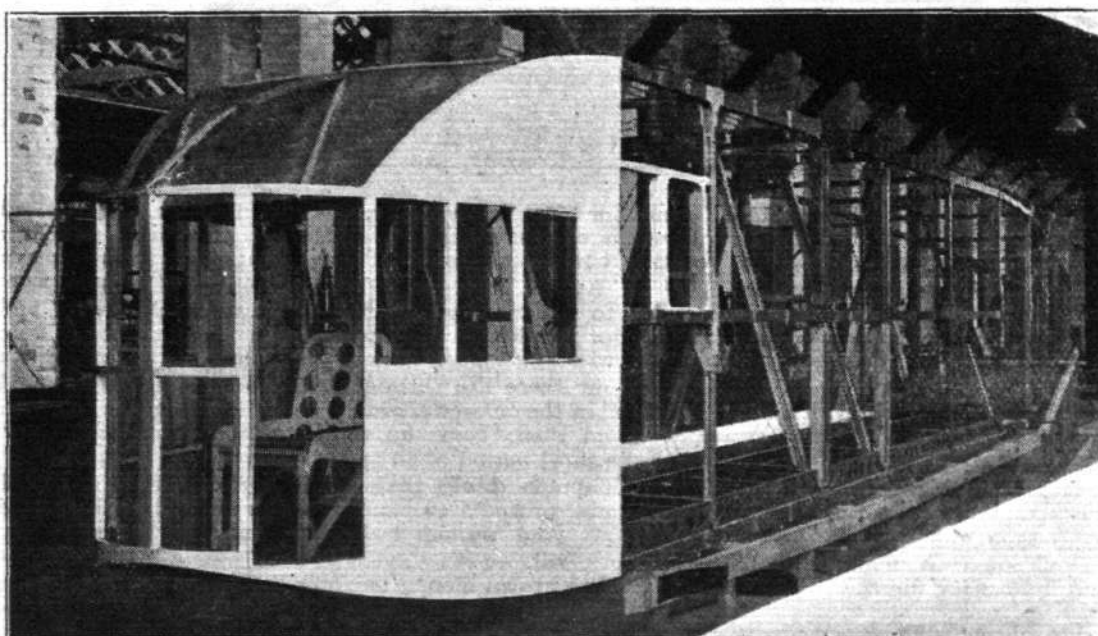
—and for competitive purposes at that—to the United States as suggested by Mr. F. Herbert Chapman, a Fellow of the R.H.S., in the Press. Mr. Chapman's suggestion is that: "Among other important possibilities of an aeroplane service to America will be the conveyance of flowers and plants for exhibition. Hitherto it has been impossible to exhibit new and choice flowers raised here at the American shows, but there are certain classes of flowers that would keep well in the cut state, even if out of water on the journey, and would then 'come up smiling' at an American show after the short period of an aeroplane passage."

Mr. Chapman thinks that "It is a great, important, and far-reaching prospect to plant breeders on both sides of the Atlantic." And we can believe it, but for many reasons, New York will, we fancy, still have to wait a little before it gets English-grown blooms on show the day of cutting.

WE are glad to be able, upon the authority of the Chancellor of the Exchequer, Mr. Chamberlain, to correct the figures regarding the cost of Air Ministry motor cars, which has been put by the Committee upon National Expenditure at the bagatelle of £2,700 per annum per touring car. Although most of the staff for whose use the cars have been necessary are thoroughly entitled to have automobile facilities for carrying out their onerous work, the sum named for maintenance is distinctly steep. Mr. Chamberlain has now stated at Edinburgh, that, having inquired into the facts, the real cost of each car works out at about £599. Even granting the extra odd £1 to bring the item to even money, this would not appear to be a very out-of-the-way cost for upkeep of a powerful car. But it would be as well if these new figures were backed by something more than mere statement, having regard to the original source of the estimates of the costs. Either Mr. Chamberlain should give bell and book for his correction, or it will be up to the Committee on National Expenditure to explain how they came to have their legs pulled so badly.



**"GOING AWAY" BY AEROPLANE.**—The wedding of Miss Standen and Mr. Hamilton at Chorley Wood last week, when the bride and bridegroom travelled by aeroplane for their honeymoon to Fowey, Cornwall. In the photograph the Avro is just about to depart.



ON THE STOCKS.—  
A view of the front portion of the fuselage of the Bristol passenger-carrying triplane. The usual transverse bracing has been modified so as to allow passengers to walk through the whole length of the cabin. There will be seating accommodation for 14 passengers, in addition to the two pilots.

QUITE a good idea to extend the utilisation of the old observatory on Ben Nevis for meteorological investigation in connection with aeronautics. The suggestion is that the building should be taken over by the Air Ministry and the weather record work, carried out there by scientists for the past 20 years up to the time of the War, should be elaborated. During the War period, the building and approaches have suffered pretty considerably, owing to the closing of the observatory. It is an opportunity which might well be taken advantage of.

EXHIBITS for the Imperial War Museum are accumulating apace, and War in the Air should assuredly not be the least represented arm of our attack and defence when the Museum ultimately opens to the public. Already amongst noteworthy exhibits in the Air Force section are a seaplane used at the Battle of Jutland and six aeroplanes of historic interest, and a number of exhibits from the German airships brought down at Cuffley, in the Thames and elsewhere. Eighteen artists have been commissioned to represent from different points of view the war in the air, with the most important of its incidents, including bombing raids in co-operation with the naval and land forces.

AFTER all, Hawker was not the first aeronaut to be stranded in the water on a record attempt. In 1912 Emile Dubonnet and W. Jourdan set out from Paris in a balloon, and fell into the Channel, at a point far from any regular steamer track. They happened to be picked up by a little Dutch tramp steamer, which had run short of coal, and was taking a short cut to the nearest port. The water was up to the men's waists when they were rescued: about the only time when the shortage of coal was a blessing!

THAT weird fowl, the paragraphist who writes notes concerning aviation on a totally invisible Remington (after the manner of good old Charles Lamb, who used to supplement his income in much the same way), has been at it again. He is full of advice for the civilian aviator. John Citizen who buys a pensioned-off Curtiss with the idea of escaping speedily to a better world, is advised to smear his face with whale oil (after bidding farewell to his better half). You can imagine him calling up the Zoo, "Have you a spare whale, I'm rather afraid of frost-bite?" We are afraid his reception would be similar to that which the unhappy Zoo telephonist gave to the joyous young stockbrokers who used to fill in the idle moments a few years back by asking to speak to Mr. C. Lyon!

Mr. Sydney Pickles at Australia House on Alexandra Rose Day auctioned an "aeroplane" for the good of the cause. Mr. Pickles leaves England next week for Australia, the land of his birth.

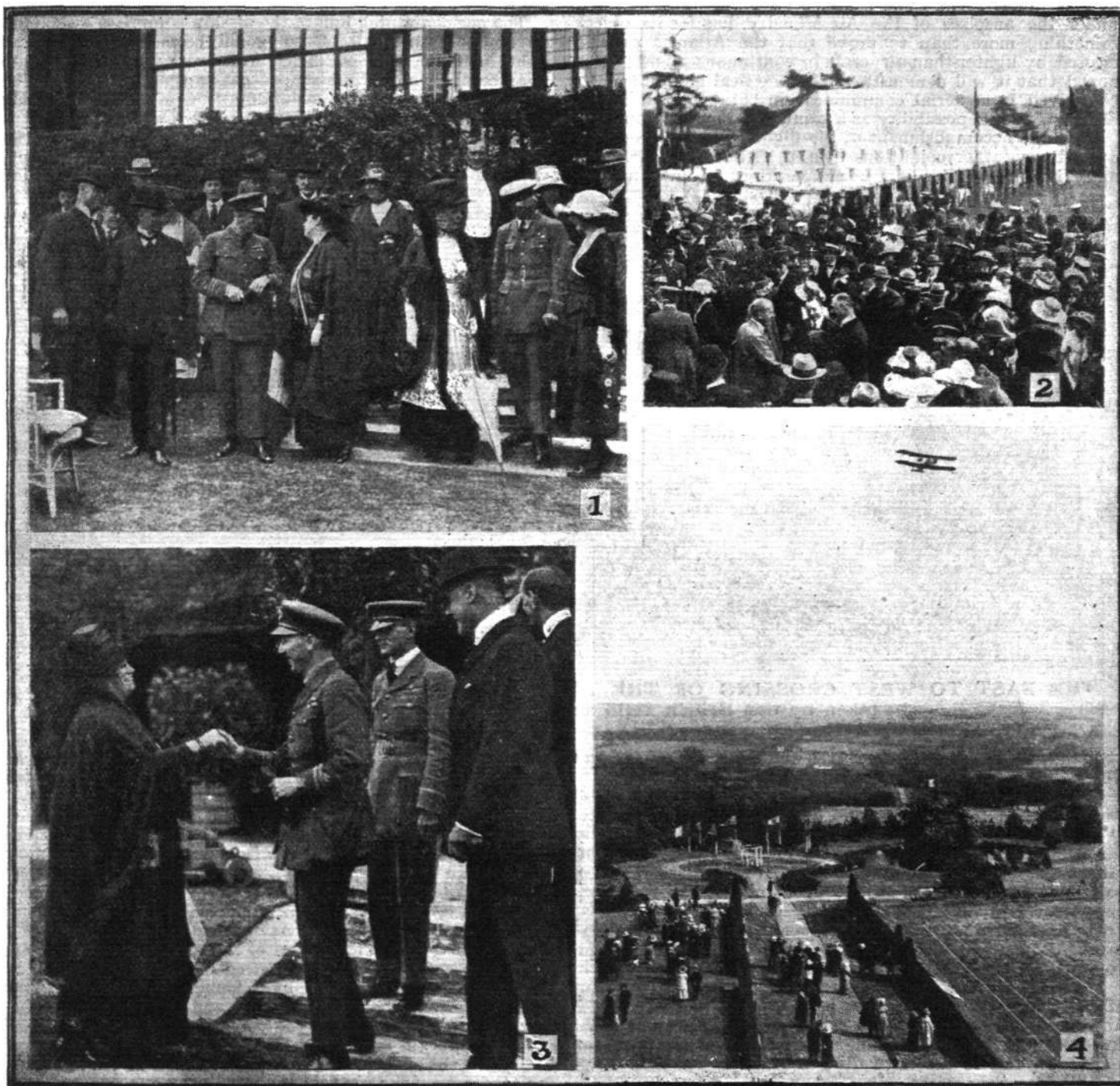




## THE ATLANTIC FLYERS AT ELSTREE

At the invitation of the chairman and directors of Vickers, Ltd., a highly successful garden party was given last week at Edgwarebury House, Elstree, the residence of Sir Trevor Dawson, to meet Capt. Sir J. Alcock, and Lieut. Sir A. Whitten Brown. The grounds of the house were delightfully decorated for the occasion, and the guests were received on the lawn by their host and hostess. During the proceedings some aeroplanes, flying at a low altitude, circled the grounds. The guests included Maj. and Miss Kennedy, Col. Arthur Lynch, Sir Ernest and Lady Moy, Col. Sir Roper Parkington, Sir John and Lady Bland Sutton, Sir James and Lady Miles, Sir Joseph and Lady Ward, Mr. Stedman, Sir Sam Fay, Lord Herbert Scott, the Greek Minister, Sir Edmund and Lady Wilde-Smith, Col. Sir Campbell Stuart, Sir Harry Brittain, Mr. Grahame-White, Mr. Gordon Selfridge, the Serbian Charge d'Affaires and Mme. Koyitch, Sir Arthur and Lady Robinson, Gen. Ashmore, Lieut.-Gen. Sir George

and Lady Macdonogh, the Duchess de Lousada, Lieut.-Gen. Sir Travers Clarke, Sir Maurice and Lady de Bunsen, Maj.-Gen. Sir W. S. Brancker, Maj. Sir Fred Sykes, Gen. Swinton, Sir Glyn and Lady West, Sir John and Lady Denison Pender, Lieut.-Col. Sir Donald and Lady Robertson, Sir George and Lady Younger, Sir Beethom and Lady Whitehead and Miss Whitehead, Gen. Sir Henry and Lady Mackinnon, Gen. and Mrs. Napier, Sir Malcolm and Lady Fraser, the Marquis and Marchioness Townshend, Sir Frank Dyson, Gen. William Alexander, Vice-Admiral and Mrs. Waymouth, the Chinese Minister, Lady Tennant, Admiral the Hon. Sir Edmund and Lady Fremantle, Sir Arthur and Lady Pearson, Rear-Admiral Sir Charles and Lady Ottley, Col. Sir Arthur and Lady Leatham, Maj.-Gen. Sir Charles and Lady Parsons, Gen. Sir Hugh and Lady Stewart, Mr. and the Hon. Mrs. Vickers, Lord and Lady Cochrane of Cults, and the Hon. Dorothy Cochrane and Comdr. the Hon. A. D. Cochrane.



The directors of Vickers, Ltd., last week gave a garden party at the residence of Sir Trevor Dawson, Elstree, to meet Capt. Sir J. Alcock and Lieut. Sir W. Brown after their crossing the Atlantic in the Vickers-Rolls aeroplane. (1) On the lawn at Edgwarebury House, Elstree. Left to right: Sir Trevor Dawson (the host), Mr. Vickers, M.P., Capt. Sir John Alcock, Lady Dawson, the Hon. Mrs. Douglas Vickers, Lieut. Sir A. Brown and Miss Kennedy. Sir Vincent Caillard and the Hon. Mrs. Stuart Bouverie are just behind Lady Dawson. (2) The reception on the lawn. (3) Lady Dawson receives Sir John Alcock and Sir A. W. Brown. Sir Trevor Dawson on the right. (4) The Vickers commercial passenger-plane flies over the grounds of Edgwarebury House.

# SOME NOTES ON THE TRANSATLANTIC VOYAGE OF R 34

THE plan for sending an airship across the Atlantic which has long been under contemplation, at first by the Admiralty, and subsequently by the Air Ministry, has in the meantime been the subject of research and thorough preparation. Beyond the element of adventure which appeals to the imagination of all, this project of traversing by air a distance of 6,200 miles on the outwards and home journeys, over what is notoriously the seat of some of the worst weather in the world, if successful, must be regarded primarily as an achievement of organisation.

By now the R 34 is well on her way, the start having been made at 2.48 a.m. last Wednesday (within 48 mins. of the official time) from the Airship Station at East Fortune, in Scotland, for the United States, to return after a short stop at Hazelhurst Field, Long Island, New York. This venture, under the auspices of the Air Ministry, has for its object something more than to prove that the Atlantic can be crossed by lighter-than-air craft in continuous flight; it is hoped that it will demonstrate the practical advantages to be derived from aerial communication between Britain and America, and its possibility as a commercial proposition.

That the accomplishment of the flight will largely depend upon the weather conditions over the Atlantic is obvious; and it is quite possible, if adverse conditions are encountered,

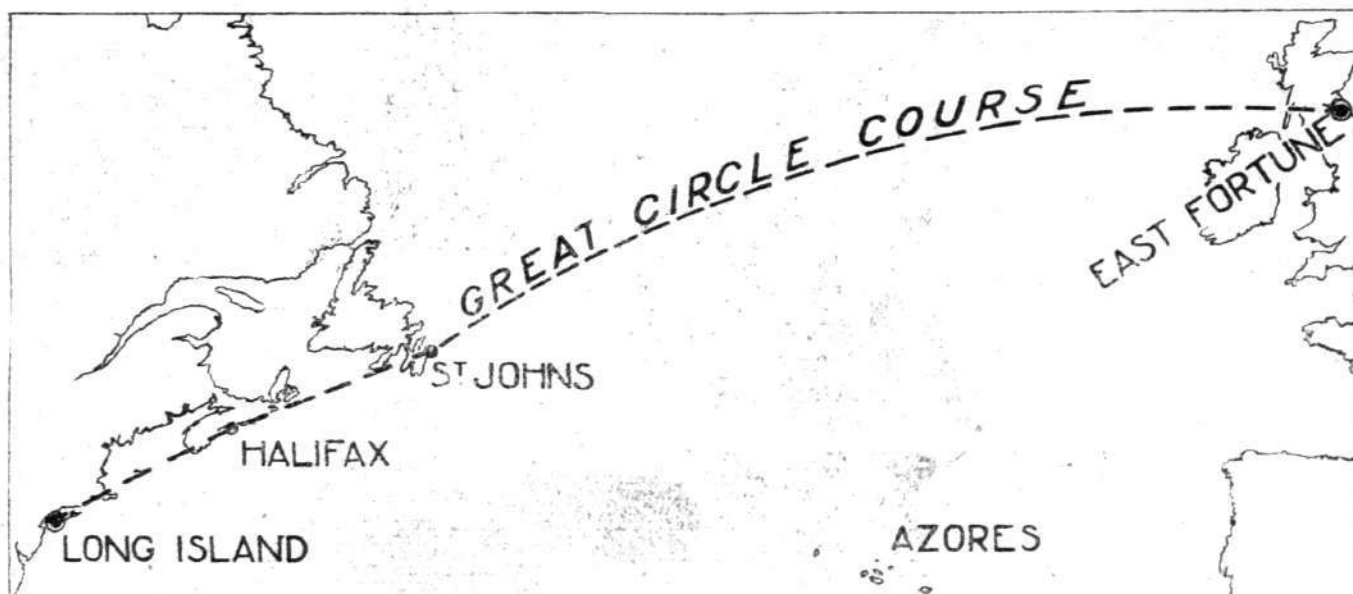
probably be afforded by the westerly winds prevailing over the course.

As a wish has been expressed that R 34 should mark her arrival over Canada, it has been arranged that if weather and other conditions permit she will pass at a low altitude over Halifax and drop a message. A bag of mails will be carried to the United States.

## Details of R 34

It may, therefore, now be interesting to describe briefly the type of airship, R 33 and R 34, which will undertake the venture. Both were designed by the Admiralty and constructed by contractors. R 34 is the work of Sir William Beardmore and Co., Ltd., Inchinnan, near Glasgow, and R 33 of Messrs. Sir William Armstrong, Whitworth and Co., Ltd., Barlow, Yorks.

The gas-containing hull of the airship comprises a skeleton streamline framework of polygonal cross-section, built of light metallic girders. This framework is divided into chambers in which drum-shaped gas-bags are enclosed. The whole is covered with sheets of doped linen, stretched tightly over the framework. The length of R 34 is 643 ft. with a maximum diameter of 78 ft. 9 ins., and the dimensions of R 33 are almost identical. The gas-bags, 19 in number, contain, when full, nearly 2,000,000 cubic ft. of hydrogen gas, giving



THE EAST TO WEST CROSSING OF THE ATLANTIC BY R 34: Sketch map of the air route to be taken by this British rigid airship during its approaching flight.

that the airship may have to return and await a more favourable moment.

It was originally intended to carry out a non-stop flight from England to Newfoundland and back, but it has since been decided that a landing will be made in the United States. Since, however, there is no Shed on the American continent large enough to accommodate an airship of this class, the R 34 will have to be moored in the open in order to replenish supplies. Two officers and a party of men of the R.A.F. are in America to superintend the preparation of the necessary arrangements, which, by the way, have been carried out in conjunction with the United States Navy Department, which has placed the landing ground at the disposal of the Air Ministry and has provided the large landing party required and all necessary stores. The country's thanks are due both to the United States Government for its interest and practical assistance, and to the Aero Club of America for their help in furthering the project.

The actual distance of the course to be followed in each direction is 3,100 nautical miles, the speed it is proposed to maintain being 40 knots, equivalent to 46 miles per hour (air speed). But so much depends on the weather that to attempt a definite estimate of the duration of the flights is not possible. For the outward journey the time required may be upwards of 100 hours or more if the speed is reduced, whilst that for the return flight may be considerably less, perhaps about 50 hours, owing to the assistance that will

a nominal lift of about 60 tons. Each has an automatic gas release valve, and some are also fitted with a hand-controlled valve in order, if necessary, to discharge gas for a descent.

Along the inside of the bottom of the hull is the keel, forming a kind of tunnel through the chambers. It gives access for the passage of the crew from one gondola to another, and contains the petrol and oil tanks and water ballast bags. A portion of it is screened apart to form a dining and recreation room for the crew. Four gondolas are attached to the underside of the hull, the navigating compartment being situated in the leading portion of the forward gondola. All the controls of the airship are centred in this compartment or cabin, which is connected by telephones, telegraphs, and voice pipes with the other gondolas and the various stations of the crew. In it, also, is the wireless cabinet.

Five Sunbeam engines of the "Maori" type of 275 h.p. each drive the airship. Detached, but adjoining the navigating compartment of the fore gondola, is an engine room containing a single motor driving, through clutch transmission, a propeller. Approximately amidships two small gondolas are suspended side by side, each housing an engine, driving a propeller, reversing gears being fitted between the engine and propellers of these gondolas for reducing the speed whilst landing. The sternmost gondola contains two engines geared to drive one large propeller. There are thus five engines and four propellers. The airship is controlled by elevators and rudders which are attached to cruciform



stabilising fins at the tail of the vessel. Its actual weight is slightly over 30 tons, and in favourable conditions it can carry nearly 29 tons of useful load, including crew, petrol, oil and ballast.

#### The Crew

Six officers and 20 N.C.Os. and airmen of the R.A.F. under the command of Maj. G. H. Scott, A.F.C., form the navigating crew of the R 34 and in addition three officers, one an officer of the U.S. Navy, will be carried to America as passengers, whose services can be called upon if necessary. The total complement on board will therefore be 30, their names being:

**Officers.**—Maj. G. H. Scott, A.F.C. (Captain), Capt. G. S. Greenland (1st Officer-Pilot), 2nd Lieut. H. F. Luck (2nd Officer-Pilot), 2nd Lieut. J. D. Shotton (Engineer Officer), Maj. G. G. H. Cooke, D.S.O. (Navigating Officer), Lieut. Guy Harris (Meteorological Officer), 2nd Lieut. R. F. Durrant (Warrant Officer), Brig.-Gen. E. M. Maitland, C.M.G., D.S.O.; Lieut.-Com. Z. Landsdowne, U.S. Navy; Maj. J. E. M. Pritchard, O.B.E.; Sergt.-Maj. H. W. R. Layes (1st Coxswain); Flight-Sergt. W. J. Robinson (2nd Coxswain).

**Riggers.**—Sergt. H. M. Watson, Corpl. F. Smith, Corpl. R. J. Burgess, L./Acting Corpl. E. P. Browdie, L./Acting Corpl. J. N. Forteach.

**Engineers.**—Flight-Sergt. R. W. Ripley, Flight-Sergt. N. H. Scull, Flight-Sergt. W. R. Gent, Sergt. T. W. Thirlwall, Sergt. A. G. Evenden, Corpl. J. H. Gray, Corpl. E. P. Cross, L./Acting Corpl. G. Graham, L./Acting Corpl. J. S. Mort, Acting Corpl. 2 R. Parker, Acting Corpl. 2 J. Northeast.

**W./T. Operators.**—Corpl. H. R. Powell, Acting Corpl. 1 W. J. Edwards.

In large airships, such as R 34, the crew is divided into watches, which take alternate spells of duty and rest, as is the old-established custom of the sea. On the journeys across the Atlantic the watches will be divided into spells of 4 hours duration. The first and second officers of the airship will take command, under the Captain, in alternate periods of watch keeping, following the precedent of the routine on board His Majesty's ships. The riggers correspond to the seamen of a marine craft, the first and second coxswains being the two senior riggers. The group of riggers is divided into two watches, one under each coxswain, and their duties during flight usually comprise height control, steering (lateral control) and keeping watch in the keel. In the Trans-Atlantic flight, the second of these duties will be performed by two officer passengers. In their periods of leisure the crew will take their meals and obtain recreation in the quarters for officers and men in the keel which are furnished with mess tables and all necessary conveniences, including a gramophone to help relieve the monotony. Sleeping hammocks are slung between the girders along the keel.

The food carried includes a two days' supply of fresh meat, and a three days' supply of bread, sufficient in all for five days full rations. A reserve of emergency rations, consisting of biscuits and chocolate, will suffice for a further three days, if necessary. It is worthy of note that the daily diet per man consists of 16 ozs. of bread (or biscuit), 6 ozs. of meat, 4 ozs. of cooked bacon, and a like amount of cooked potatoes, cheese, fruitarian cake and chocolate, supplemented by an allowance of jam, toffee, sugar, tea, condensed milk and condiments. The total weight of each man's daily ration is  $51\frac{1}{2}$  ozs., possessing a heat value of 4,695 calories. Food and water can be heated in boilers, of which there are three fitted in the exhaust pipes of the engines. Each is capable of boiling a gallon and a half of water in 8 mins. It will be the duty of one of the riggers to act as cook, whilst the engineers will tend the boilers. Eighty galls. of fresh water are carried in tanks; and one ton of water in one of the ballast bags is also fit for drinking. As a protection against extreme cold the crew will wear silk underclothing, thick woollen garments, and a wind-proof flying suit overall. An interesting feature of the flying suit is that it is combined with a parachute harness, which permits full freedom to the wearer. Parachutes and lifebelts are also provided in appointed places for each member of the crew.

#### Atlantic Load

It is impossible to determine exactly beforehand the load with which the airship will leave the ground, as this is affected by the state of the atmosphere and purity of the gas—e.g., a low temperature and high barometer would give the airship greater lift than a high temperature and low barometer by reason of the greater density of the air. The load carried, therefore, must be adjusted to suit the conditions under which a start is made. To obtain the most favourable conditions for lift, and because the wind is usually more settled after sunset, the start will probably take place during the night.

An estimate of the possible load is as follows, but it must

be understood that the quantity of petrol is subject to reduction:—

Petrol, 18.0 tons; oil, 1.0 tons; water, 3.5 tons; crew, 4.0; total, 26.5 tons.

In allowing for the weight of a man complete with his food and comforts, it has been calculated that 300 lbs. is a fair average. This is of interest, as it gives some idea of the approximate allowance that may be made for each passenger in future commercial airships.

#### Fuel Consumption, Speed and Height

At the cruising speed of 40 knots, which is attained by running three engines out of the total number, the petrol consumption is slightly over 1 gallon per mile—a remarkably low figure, when it is considered that each engine is rated at 275 h.p., and that the airship weighs close upon 60 tons when fully loaded.

An economy in fuel consumption can be effected by flying at lower speeds, as is indicated by the following table which is based on all the engines being run:—

Engine Speed.	Airship's Speed (knots).	Petrol Consumption. (Gals. per hr.)
1,800 r.p.m.	47	65
1,600 r.p.m.	42	50.8
1,400 r.p.m.	36	47.4

At the commencement of the outward and homcoming journeys the total weights will be adjusted to allow of a rise aerostatically to about 1,000 ft. During the voyages, variations in the temperature and barometric pressure of the atmosphere, notably those which occur between day and night, will have the effect of altering the equilibrium height of the airship, and as petrol and oil are consumed it will, subject to control, have a tendency to rise. One of the problems with which the Captain will have to cope is concerned with the effect of sunshine in raising the temperature of the gas above the temperature of the air; this phenomenon, which is known as super-heating, is accompanied by expansion of the gas, with consequent loss through the automatic gas valves and a tendency of the airship to rise. If the vessel is allowed to rise, further loss of gas will ensue.

The planes and shape of an airship combined with its velocity give it the power to counteract a certain amount of difference in lift from the equilibrium point. This can be effected either by using the control planes, with the airship trimmed level, or by shifting weights, such as petrol or a number of the crew, along its length in order to trim the ship up or down by the bows so as to counteract heaviness or lightness, slight variations being corrected by the planes. By careful attention to the trim it is possible to keep the airship at a constant altitude, and the ill-effects that would result if superheating were not controlled are overcome. In 24 hours the vessel will go through a series of changes of lift more or less on these lines, the extent of the change of temperature of air and gas depending entirely upon the weather. The anticipation of the state of the airships buoyancy is one of the pilot's duties that calls for the greatest experience and judgment.

At its destination the vessel may, at the discretion of the Captain, be able to ascend to about 12,000 ft. The height attainable will be dependent upon the amount of load (and gas) expended and the state of the atmosphere. Long Island will probably be approached at an altitude of 2,000 ft.

#### Navigation

The navigation of airships admits of more precise methods than are possible in the case of aeroplanes. It is more closely allied to navigation on the sea, though far more complicated, because the swiftly flowing, variously directed winds with which the air navigator has to reckon are without parallel in sea navigation. It, therefore, demands a higher degree of skill. On the accuracy of the work of the navigator of R 34 will depend largely the success of the flight. It must be realised, of course, that whatever its speed an airship is affected by the wind—i.e., the movement of the air in which it floats—so that slight variations in wind force or direction, taking into account its high velocity, would after some hours flying cause large errors in the estimated position of the airship. Over the North Atlantic there is always wind. Apart from the general slow movement of the whole body of air eastward, which in itself is a handicap to an aircraft flying from Britain to America, there is, a constant succession of cyclonic disturbances throughout the whole of the year. These depressions frequently form over or near the American Continent and pass slowly across the Atlantic towards Europe with the general wind drift.

Essentially, each depression has the form of a roughly circular revolving mass of air with the atmospheric pressure decreasing towards the centre. In the northern hemisphere the direction of rotation is counter-clockwise so that to the north of the disturbances the wind circles to the west. Also, south of the track of these depressions, between the United States on the one side and the Bay of Biscay and Spain on the other, there is almost invariably an area of high pressure, that is, an anti-cyclone. In this area the conditions are the opposite of those in a depression, the wind revolving in a reverse direction, so that to the north the winds have a tendency to move from west to east as they do on the adjacent south side of the depression.

The position of this high pressure area is influenced by the passage of the depression to the north of it, and although it is sometimes referred to as being centred in the neighbourhood of the Azores it is, in fact, seldom stationary and moves within the limits of latitudes  $30^{\circ}$  and  $50^{\circ}$ , bounded to east and west by Europe and America. It will be seen, therefore, that in order to obtain easterly winds to favour the outgoing journey it is necessary to go either to the north of the depression or to the south of the high pressure system. In the case of the voyage of R 34 it is proposed to take the northerly course. As a rule, it would be necessary to seek farther north than Iceland for these east winds, but a number of occasions occur when they come much more to the south, and it is in such conditions as these that R 34 would gain the greatest assistance from the wind.

The advantage to be derived from the direction of the wind, however, is frequently more than counterbalanced by the fact that in a depression there is generally a vast amount of cloud; indeed, clouds may extend from within 500 ft. of the surface to heights exceeding 30,000 ft., while the cloud area may cover hundreds of miles. Fog is prevalent in the Atlantic during the whole of the year and particularly during the present warm months, but, owing to the height of the fog banks, its effects on air navigation are less marked than is the case with low clouds.

The navigator of R 34 will attempt to follow the "great circle" course from the north of Ireland to St. Johns, Newfoundland, that is, the portion of a line girdling the earth that connects the two places, appearing as a curved line upon a Mercator's chart, thence to Long Island *via* Halifax, if possible. He will deviate from this course in order to obtain more favourable weather conditions, but will keep to it as far as possible. It will take the airship to the north of the shipping lane to New York, but close to the track of ships bound to or from the St. Lawrence in Canada.

One advantage possessed by the air navigator over the seaman, is his ability to determine the course he is "making good" by observing with the aid of a Drift Bearing Sight the direction of motion of his craft relative to the sea or land below. At the present season of the year he is helped by the long period of daylight, amounting to 18 hours out of the 24. At night, or when visibility is bad, smoke bombs or flares can be dropped on to the sea to serve as a definite point of observation for determining the drift. The angle between the course steered and the course "made good" and the airship's air speed being known, the speed and direction of the wind can be calculated if readings are taken when travelling in two directions separated by  $45^{\circ}$  or more. But apart from these methods of navigation by "dead reckoning" the position of the airship can be determined with fair accuracy either by celestial observation by sextant, in the manner customary in marine navigation, using the sun by day and the stars by night, or by the wireless direction-finding apparatus. With this instrument it is possible to determine the direction of signals received. The point of interception of such bearings from known points on a chart gives approximately the position of the airship. Both celestial observations and wireless direction-finding are liable to error, but the mean of several observations should give a close approximation of the true position.

#### Meteorology

The condition of the weather must obviously be the first consideration for Captain and navigator, and the responsibility of the meteorological officer on board will be no light one. It will be his task to furnish reports of the weather around and ahead of the airship to enable the navigator to form an opinion as to the most favourable course to set. The Air Ministry has already in existence an extensive organisation of weather reporting, created for the benefit of competitors in the Trans-Atlantic flight competition. The Admiralty are also arranging to assist the R 34 by stationing two battle cruisers at certain pre-arranged points in the Atlantic. A meteorological officer from the Air Ministry will be on board each of these vessels to take customary

observations, and to test the wind at different altitudes by means of kites and pilot balloons. The meteorological officer accompanying the R 34 will compile his own weather charts from reports transmitted to him by wireless. The latter will comprise the observations from the battle cruisers, from the United States Navy, Canada, Newfoundland, Ireland, Bermuda, Scandinavia and from the Azores and the ships in the Atlantic, as well as the synoptic report of the British Isles which is issued four times daily and an official bulletin of conditions in the Atlantic, both existing and probable, compiled by the Air Ministry twice daily. On the return flight he will also take into consideration the daily weather reports signalled by wireless from the Eiffel Tower.

Observations carried out from the airship itself will also be of value, and in this connection two methods have been proposed by which the meteorologist will be able to determine roughly the barometric pressure at the surface of the sea. One, which constitutes an innovation of unproven efficacy, has as its object the determination of the exact height of the aircraft above the sea, so that the barometric pressure below can be calculated from the reading in the car. It consists of firing a gun and calculating the height from the time taken to hear the answering echo of the report from the surface of the water. Fog or low clouds detract from the reliability of this system. Alternatively, a maximum reading barometer, which indicates and records the highest atmospheric pressure into which it has descended, may be lowered from the airship to near the surface of the sea.

#### Wireless Telegraphy

Apart from naval craft few or no seagoing vessels are equipped with a wireless telegraphy installation comparable in range and utility with that of the R 34. A combination of instruments has been devised to enable the airship to communicate with any wireless station or any warship within a range of over 1,000 miles, and other ships carrying wireless within a range of 100 miles. A wireless telephone attachment will also be carried which will permit speech to all types of wireless receivers up to a radius of 50 miles. Reference has already been made to the wireless-direction-finding apparatus, which it is hoped will prove of considerable value in navigation. All possible means for maintaining wireless communication with the airship in flight have been organised and co-ordinated, and it is hoped that communication will be maintained throughout the whole period of the voyage from the stations at the Air Ministry, East Fortune, Pembroke, Ponta Delgada in the Azores and St. Johns in Newfoundland.

The Marconi Wireless Telegraphy Co. have also kindly placed at the disposal of the Air Ministry their very complete organisation of wireless facilities over the North Atlantic, including the free use of their private telegraph lines and the two high-powered Trans-Atlantic stations at Clifden in Ireland and Glaco Bay in Nova Scotia. These stations will be utilised at routine times for transmitting signals to the airship from Britain and from the United States, and for sending messages across the Atlantic in connection with the flight. To ensure the reception by R 34, whatsoever her position, of messages passed by this route, arrangements have been made whereby the Glaco Bay Wireless-Telephone station will intercept and repeat all messages emanating from Clifden addressed to R 34, and conversely Clifden will repeat all messages for R 34 from Glaco Bay. The airship will also use these two stations for "direction-finding." It will be seen that several wireless routes may be employed; the selection of the quickest route will be made by the Air Ministry.

#### The Engineers

The duties of the engineers will perhaps be the most arduous of those of any of the crew. There is something peculiarly fascinating in the work of these men, whose task it will be to keep the motors running day and night for the many hours of the journey. They will have, of course, their alternate four-hour spells on and off duty. Two engineers are allocated to each engine and two to directing the distribution of petrol, which has to be pumped from the separate tanks along the keel to the storage tanks above each engine. A constant watch has to be kept that the engines are not starved, and petrol has to be drawn from the tanks with due attention to the Captain's instructions, so as to keep the airship in her necessary fore and aft trim.

Many long endurance cruises have been achieved by airships, but none which offered difficulties from the mechanical standpoint equal to those involved in the Trans-Atlantic passage. One of the possible causes for trouble against which provision has had to be made is the coagulation of the lubricating oil in the supply tanks, owing to the extreme cold which may be encountered, for instance, when passing over an ice-field, or



at night. To eliminate this difficulty, so far as is practicable, special tanks are placed in the gondolas and through a coil inside these is circulated hot water from the engine cooling systems. The idea is to utilise the main tanks in the hull when that is possible and to fall back on the warmed oil only when the flow from the main tank fails.

One inherent advantage possessed by airships over aeroplanes is the possibility of executing engine repairs during flight, and for this purpose a number of spare parts are carried on board the R 34. Included with countless other minor parts, there are such items as two blocks of cylinders, connecting rods, pistons, valves, half a dozen magnetos and a gross of sparking plugs, sufficient to repair almost any simple engine defect. That the engineering staff must be equipped for every emergency was recently demonstrated on one of the trial flights, when it happened that a leather joint in an oil circulating system burst. Wooden plugs were at hand to stop the ends of the parted joint, and rubber connections and pipe clips of all sizes were also in readiness—but there was no leather. The engineer officer at once cut out the tongue of one of his boots and within a few minutes the engine was again running. In the event of an engine having to stop for repairs during the Atlantic flight there is a possibility of the water in the radiator freezing if the temperature is low. This will be guarded against.

#### In America

On arrival in the United States the airship will be moored



#### A Journalistic Record

A VERY fine object-lesson is afforded of the superiority of the aeroplane in times of emergency over other orthodox forms of communication, in the hustle which Mr. Ward Price, the *Daily Mail* correspondent, indulged in on Peace-signing day, last Saturday. Immediately after the signature of the Peace Treaty in the Hall of Mirrors, Mr. Price motored to Buc, and, there taking an aeroplane, reached London in time to write a complete story of the happenings for the

in the open and will probably not remain longer than is absolutely necessary for taking in gas, fuel and stores, and for the adjustment of engines. This may be completed in 10 hours, or at the most, it is hoped, 24 hours.

If the weather is favourable it will be possible to bring the vessel close to the ground and refill gas bags and fuel tanks without difficulty, otherwise it may be necessary to anchor her clear of the ground by means of a "three-wire" mooring gear. This is a "tripod" of three cables, attached at the apex to a swivel under the bows of the airship, and arranged so that the airship swings head to wind and its lift counteracts the force of the wind. Weather reports from all sources will continue to be furnished regularly to the meteorological officer of the airship, who will be assisted by the meteorological officer at Newfoundland. It is hoped to start the flight so as to ensure the prevalence of good weather conditions at Long Island and the commencement of the return voyage without delay.

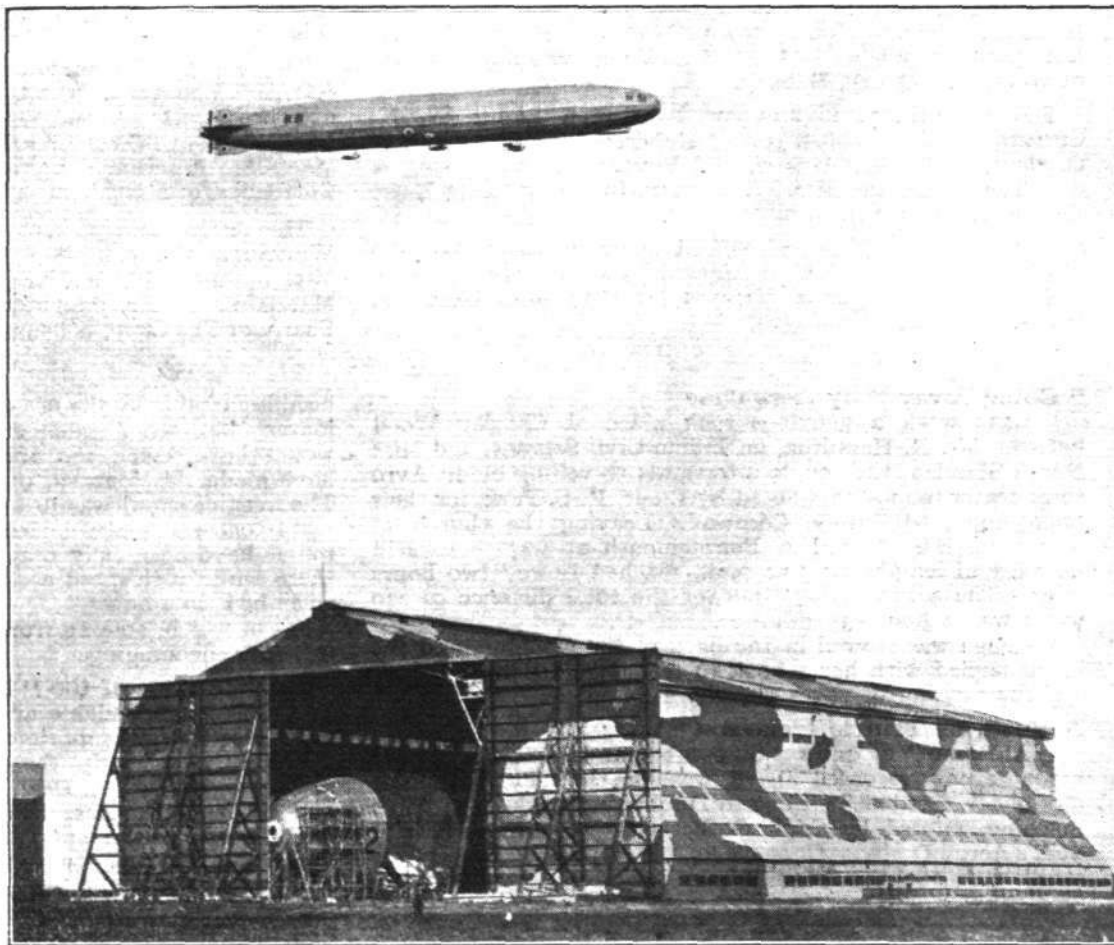
#### The Homeward Journey

The return journey will present fewer difficulties than the outward. As stated, the winds will probably be considerably more favourable, so that the duration of the flight and the strain on the personnel and engines will be less. Also, there will be an advantage in flying to the southward of disturbed weather, which will reduce the chance of any trouble due to the effects of cold and precipitation, as, for instance, rain, sleet and snow.

edition of the *Weekly Dispatch* published at 3.30 on Sunday morning. By way of contrast, the Paris Post Office was congested with telegrams, some of which took 24 hours to reach London.

Through Mr. Ward Price's flight the *Weekly Dispatch* was enabled to publish a much fuller account of the signing than any other Sunday paper, in addition to a whole page of photographs taken during the afternoon, which were also brought by aeroplane.

The R. 31 over her camouflaged shed.—As the first giant airship made in this country, a few particulars of the R. 31, which was built by Messrs. Short Bros., may be of interest. She has a length of 615 ft., and a total capacity of 1,550,000 cub. ft., to lift 47 tons; she is fitted with five Rolls-Royce engines, totalling 1,500 h.p. Running through the keel there is a triangular structure of girders which forms a passage-way, from each side of which there are suspended the petrol tanks, water ballast bags and, in war time, bombs. The Rolls-Royce engines are in five units, two in the forward cars, two amidships, and one in the after car. The propellers, each 17 ft. diameter, are direct-driven, whilst the engines amidships have a reversing gear. The control is under the ship at the forward end, and she is navigated and controlled from this car, which also contains the wireless cabin. The ship is divided into 21 compartments, each of which contains a gas bag. These gas bags practically fill the whole of the hull, but there is a clear air space between the outer cover and gas bags which tends to keep the gas at an even temperature. At the top of the forward end of the ship there is fitted the gun platform, whilst machine guns are also fitted at various points on the top of the walking way at the tail end and in all the cars. A complete electric lighting outfit is provided, a telephone exchange is fitted from the control car to all parts of the ship. During flight, hot food is supplied to officers and crew by means of an apparatus fitted to the exhaust pipe from the engines. A parachute is supplied to each member of the crew. These parachutes are stowed at various points of the ship.



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# PERSONALS

## Married

Lieut. F. H. ABELL, R.A.F., son of the late F. H. Abell, of Cape Town, was married on June 9 at All Saints', Bulkeley, Egypt, to GERTRUDE L., daughter of JOHN T. ATKIN, of Bulkeley, Egypt.

Lieut.-Col. OSBORNE ARTHUR BUTCHER, D.S.C., R.A.F., was married on June 16, at All Souls', Langham Place, to BEATRICE VIOLA, younger daughter of the late Edward Dorman Hodgson, of the Middle Temple, Barrister-at-Law, and Mrs. Dorman Hodgson, of 12, Montpelier Place, Brighton, and The Sycamores, Newick, Sussex.

Capt. DONALD SINGLETON EVANS, R.A.F., son of Mr. and Mrs. W. H. Evans, of Buntingford, Herts, was married on June 25 to GLADYS KATIE, daughter of the late Mr. and Mrs. THOMAS AYLING, of Southsea, Hants.

Maj. HUGH GARNETT, R.A.F., was married on June 18 at St. James' Church, Emsworth, to ENID, widow of C. J. R. DAWKINS, 9th Welsh Regt.

Capt. FRANK DOUGLAS HOLDER, M.C., the Buffs and R.A.F., younger son of Mr. and Mrs. E. Holder, of Purley, Surrey, was married on June 18, at the Cathedral Church, Chelmsford, to CYNTHIA OLIVE, only daughter of Mr. George W. P. HART, of Chelmsford.

DONALD F. TYSOE, R.A.F., was married on June 24 at Christ Church, Lancaster Gate, W., to ETHEL MILNE FERNYHOUGH.

## To be Married

The engagement is announced between Lieut. C. F. BARTON, R.A.F., of Toronto, Canada, and MARY LETITIA DRIFFIELD LEE, younger daughter of the Rev. Frederick and Mrs. Lee, of Woodton Rectory, Bungay.

The engagement is announced between Lieut. W. N. CUMMING, R.A.F., eldest son of Robert Cumming, 20, Bute Gardens, Hillhead, Glasgow, and PHYLLIS MAUDE, youngest daughter of Mr. and Mrs. W. MARTIN, Inverness Court Hotel (late of Hampstead).

The engagement is announced between Capt. GERARD FANE, D.S.C., R.A.F., son of Mr. Sidney Fane and Mrs. Fane, and RHODA, daughter of Mr. and Mrs. NICHOLAS BACON, of Raveningham Hall, Norwich.

## "Going Away" by Aeroplane

LAST week a marriage took place at Chorley Wood between Mr. R. Hamilton, an Indian Civil Servant, and Miss Norah Standen, the couple afterwards travelling by an Avro three-seater limousine, piloted by Lieut. R. S. Park, for their honeymoon, to Fowey, Cornwall. Leaving the church at 3.30 p.m., they landed at Bournemouth at 4.45 to take in petrol, and leaving at 5.30 p.m., reached Fowey two hours later. The actual flying time for the total distance of 240 miles was 2 hours 35 minutes.

Luggage was stowed in the back of the machine, and the bride carried with her a book to read, but deponent sayeth not the number of pages actually perused.

## A Business Trip to Ireland

A "FLIP" of quite a different character to the honeymoon event recorded above was the journey the other day of Mr. Gordon Selfridge to Dublin and back in an Airco machine, piloted by Capt. Gathergood, the winner of this year's Aerial Derby. Upon his arrival in Dublin Mr. Selfridge said that the journey over was devoid of any untoward incident.

"We passed two storms and went round one," he said. Speaking of the future of commercial flying, he suggested that if one could fly from London to Dublin in three and a half hours, as he did, it should not be difficult to live in Dublin and do business in London.

He predicted that "we shall all be flying across the Atlantic in another three, four or five years, perhaps less."

On his return, *via* the air, to Herdon Mr. Selfridge said: "By using an aeroplane as a super-special train I have been able to transact business with a rapidity which would have

The engagement is announced between Capt. N. L. GARSTIN, R.A.F., son of Mr. F. C. Garstin, C.C. and R.M., Stutterheim, Cape Province, South Africa, and MARIA OSSORIO, only child of the late F. de P. Ossorio, of Manila, and Mrs. F. de P. Ossorio, 2, Boyne Park, Tunbridge Wells.

The marriage arranged between Capt. A. KNIGHT, M.B.E., North Lancs. Reg. and R.A.F., and CHARLOTTE BEATRICE, only daughter of Dr. and Mrs. DITKOWSKI, of Paris, will take place at Brompton Oratory on Tuesday, July 8, at 2 p.m.

The engagement is announced between Lieut. R. B. LOVE-MORE, D.S.O., R.A.F., elder son of Mr. and Mrs. W. B. Love-More, of Swaziland, South Africa, and Miss GWENDOLEN AMY EDWARDS, only daughter of Mr. and Mrs. H. C. Edwards, of Sussex House, Raynes Park.

The engagement is announced between Capt. DENIS C. W. SANDERS, R.F.C., eldest son of Gordon Sanders, M.D., Villa Martha, Cannes, France, and NANCY, widow of Lieut. IVAN B. SPROT, Cameron Highlanders, and daughter of Sir George and Lady Berry, 31, Drumsheugh Gardens, Edinburgh.

The engagement is announced between Capt. R. M. CATTERSON SMITH (late R.A.F.), younger son of Mr. and Mrs. Catterson Smith, of Edgbaston, to CAROLINE MABEL, eldest daughter of the late Mr. and Mrs. RYLAND, of Baskerville House, Harborne, Birmingham.

The engagement is announced between Capt. R. C. M. SMITH, formerly of the R.F.C., elder son of Mr. and Mrs. Stephen Smith, of 67, Park Hill, Clapham Park, and LILIAN, younger daughter of the late GEORGE L. E. RAGGETT and Mrs. Raggett, of 99, Philbeach Gardens, Earl's Court.

The engagement is announced between Capt. HAROLD ALFRED WHISTLER, D.S.O., D.F.C., Dorsetshire Regt., attached R.A.F., second son of the Rev. A. J. Whistler and Mrs. Whistler, of Warkton Rectory, Kettering, and HÉLÈNE MARGUERITE, second daughter of M. J. GOTTIGNIES and Mme. Gottignies, of Marchienne-au-Pont, Belgium.

The engagement is announced between Capt. RAYMOND WHITAKER, the Rifle Brigade and R.A.F., son of Mr. and Mrs. Arthur Whitaker, of 52, Cadogan Square, and HILDA MARGARET SHARP, daughter of Lieut.-Col. and Mrs. G. E. Sharp, of The Close, Salisbury.

been impossible by the use of any other vehicle. The double journey between London and Dublin by train and steamer would have taken me about 20 hours. By aeroplane I have made this journey, of roughly 700 miles, in 6½ hours. The average speed was just over 100 miles an hour.

"If one can make a pioneer flight like this before flying routes have been fully organised, it shows what possibilities there are in high-speed aerial transport to the business man when he is in a hurry."

All of which, coming from such a very live business man, is highly encouraging.

## The Enterprise of the "Evening Standard"

VERY commendable and worthy of great results is the enterprise of the proprietors of the *Evening Standard*, in despatching regularly their newspaper by means of Avro machines to Dover, Deal, Eastbourne, Brighton, Seaford and other south coast towns. By this method the paper is obtainable at these popular resorts practically at the same time as in the London suburbs, about 50 minutes roughly being occupied in the journey from Hendon. Lieut. George Lusted, A.F.C., was the pilot for inaugurating the programme, and, judging by reports, this smart work is highly appreciated.

## "R. 34" to Carry Mails?

ACCORDING to information received in Halifax, N.S., the Admiralty has instructed the captain of the dirigible "R. 34" to pass over Nova Scotia and, if possible, Halifax, on its Transatlantic flight (unless weather conditions should necessitate a more southerly course), and to drop on its way a bag of letters from Great Britain addressed to prominent Canadian officials.



# THE ROYAL AIR FORCE

London Gazette, June 24

**Flying Branch**

Capt. W. St. J. Scott-Scott to be Capt., from (S.O.); April 10.  
 Lieut. W. D. Harris to be Lieut. (A.) from (O.); Jan. 8.  
 Sec. Lieuts. to be Lieuts.:—J. McFarlane; April 26, 1918 (substituted for notification in *Gazette* of April 11). L. E. O. Lounds; May 30, 1918 (substituted for notification in *Gazette* of March 7). H. J. Fuller; June 14, 1918 (substituted for notification in *Gazette* of Feb. 4). C. H. G. Sanders; Oct. 4, 1918 (substituted for notification in *Gazette* of March 7). J. G. Prestwick; Oct. 18, 1918 (substituted for notification in *Gazette* of March 7). H. R. Hill, M.C.; Nov. 16, 1918 (substituted for notification in *Gazette*, May 23).

K. E. M. Holmes (Sec. Lieut., R.G.A., T.F.) is granted a temp. commn. as Sec. Lieut. (A.); Sept. 19, 1918.

C. H. Matthews (Sec. Lieut., Hamps. R., T.F.) is granted a temp. commn. as Sec. Lieut. (O.); Oct. 25, 1918.

316207 Flt. Cadet W. W. Brander is granted a temp. commn. as Sec. Lieut. (K.B.); Oct. 6, 1918.

The following relinquish their commns. on ceasing to be employed:—Capt. (Hon. Maj.) J. A. Dennistoun (Maj., Manitoba R.); Nov. 25, 1918. Lieut. G. S. O'Brien (Lieut., Can. Cyclist Corps); Feb. 14. Lieut. G. W. Blacklock (Lieut., Quebec R.), Lieut. (Hon. Capt.) A. R. Fairbairn (Capt., C. Ont. R.), Lieut. J. E. Hanning (Lieut., Can. Engrs.), Lieut. H. G. Kent (Lieut., C. Ont. R.), Lieut. N. I. Sheppard (Capt., Alb. R.), Lieut. (Hon. Capt.) W. H. Shoenberger (Capt., C. Ont. R.), Maj. F. V. Woodman (Maj., Sask. R.); March 31. Lieut. C. J. L. Laurence (Lieut., C. Ont. R.); April 14. Lieut. W. M. E. Chester (Lieut., C. Ont. R.); April 16. Sec. Lieut. (Hon. Lieut.) J. C. Snelgrove (Capt., Can. R.); April 29. Capt. P. M. L. Edmunds (Lancers); May 19. Sec. Lieut. (Hon. Capt.) G. H. Gillis, D.F.C. (Capt. Can. A.P.C.); June 5. Lieut. A. Dodds (Lieut., N. Staffs. R.); June 7. Lieut. S. H. Short (Lieut., Can. F. Art.); June 10. Lieut. H. Towse (Lieut., Manitoba R.); June 11. Sec. Lieut. E. Hill (Lieut., C. Ont. R.); June 12. (Then follow the names of 175 officers who are transfd. to the Unemployed List under various dates. We regret that owing to great pressure on our space it is impossible to reprint this portion of the List.—Ed.)

Maj. F. E. Sandford, A.F.C., is temporarily transfd. to the Unemployed List; June 16.

Sec. Lieut. (Hon. Capt.) A. Cumming relinquishes his commn. on account of ill-health, and is permitted to retain the rank of Capt.; May 29.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—J. A. Chubb, W. Gaunt (contracted on active service), G. R. Halliday; June 12.

Lieut. C. F. Wolley-Dod (Lieut., Notts. and Derby. R.) resigns his commn., and is permitted to retain his rank; May 16.

Lieut. C. B. R. Macdonald (Capt., R.E.) resigns his commn.; June 18.

Sec. Lieut. J. S. McGeown relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; June 12.

Sec. Lieut. C. E. Irving is antedated in his appointment as Sec. Lieut. (A.); June 1, 1918.

The date of appointment of Sec. Lieut. T. Mundy and Sec. Lieut. E. A. Murray to be Lieuts. is March 8, and not May 8, as stated in the *Gazette* of May 23.

The rank of Sec. Lieut. C. D. Clark is as now described, and not as stated in the *Gazette* of May 30.

The initials of Lieut. L. G. Hall are as now described, and not as stated in the *Gazette* of April 4.

The surname of Maj. (actg. Lieut.-Col.) A. K. Tylee, O.B.E., is as now described, and not "Tyler," as stated in the *Gazette* of May 9.

The notifications in the *Gazette* of March 7 concerning the undermentioned officers are cancelled:—Sec. Lieut. A. Holdsworth, Sec. Lieut. C. W. Phillips, Sec. Lieut. T. D. Sykes.

The notification in the *Gazette* of March 18 concerning Capt. D. Plaistowe is cancelled. (Notification in the *Gazette* of April 4 to stand.)

The notification in the *Gazette* of March 28 concerning Lieut. J. L. Davies is cancelled.

The notification in the *Gazette* of April 11 concerning Sec. Lieut. C. D. Metcalfe is cancelled. (The notification in the *Gazette* of April 29 to stand.)

The notification in the *Gazette* of April 29 concerning Lieut. W. G. Barlow is cancelled.

The notification in the *Gazette* of May 16 concerning Sec. Lieut. M. D. McTaggart is cancelled.

The notification in the *Gazette* of June 3 concerning Lieut. A. R. Cowan is cancelled.

**Administrative Branch**

Cpts. to be graded for purposes of pay and allowances of Maj.s, whilst employed as Maj.s:—W. R. Mackenzie, D.S.C., P. J. Wiseman; May 1.

Capt. (actg. Maj.) J. Selwyn to be Capt., from (S.O.) and relinquishes the actg. rank of Maj. on reduction of establishment; March 24.

T. I. Birch (Capt. and Qtr., R.W. Surr. R.) is granted a temp. commn. as Capt.; Oct. 30, 1918, with seniority from April 1, 1918.

Lieut. E. R. Wilkinson to be actg. Capt. whilst employed as Capt., from July 21 to April 30.

Lieut. D. H. Macintyre to be Lieut. from (A.); June 4.

Sec. Lieut. J. Cobley to be Lieut.; April 25, 1918. (Substituted for the notification in the *Gazette* of Feb. 14).

Sec. Lieuts. to be actg. Lieuts., without pay and allowances of that rank, whilst employed as Lieuts.:—E. J. Gordon, from Feb. 5 to Feb. 28. T. Caine, from Feb. 20 to April 30. Sec. Lieut. J. W. A. Legge-Willis to be Sec. Lieut., from (K.B.); May 2.

F. V. Russ is granted a temp. commn. as Sec. Lieut.; June 20.

Lieut. J. H. Lester relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; May 26 (substituted for notification in *Gazette* June 6).

(Then follow the names of 29 officers who are transfd. to the Unemployed List under various dates.)

Maj. Sir J. Eardley-Wilmot, Bt. (Rif. Bde., S.R.), relinquishes his commn. on account of ill-health caused by wounds; June 20.

Capt. L. E. Eeman relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; March 8 (substituted for the notifications concerning this officer in the *Gazettes* of March 7 and 28).

Lieut. (Hon. Capt.) H. J. Petty relinquishes his commn. on account of ill-health contracted on active service, and is granted the rank of Capt.; May 31.

Lieut. H. P. L. Gardner (Norfolk R., S.R.) relinquishes his commn. on account of ill-health contracted on active service; June 21.

The notification in the *London Gazette* of April 1 concerning Lieut. J. K. Line is cancelled.

The notification in the *London Gazette* of June 13 concerning Sec. Lieut. (Hon. Capt.) A. N. Wyatt is cancelled.

**Technical Branch**

Lieut.-Col. H. Blackburn to be Lieut.-Col. from (S.O.); April 2.

Capt. A. Garrard to be actg. Maj. while employed as actg. Maj., Grade (A), from April 1, 1918, to April 30.

Capt. (actg. Lieut.-Col.) G. Waddell to be Capt., Grade (B) from (S.O.), and to relinquish the actg. rank of Lieut.-Col.; Sept. 22, 1918.

Lieut. W. J. Bunting to be actg. Capt. while employed as Capt., Grade (A), from Nov. 1, 1918, to April 30 (substituted for the notification in the *Gazette* of May 9).

Lieut. E. W. Chatterley to be actg. Capt. while employed as Capt., Grade (B), from Oct. 2, 1918, to April 30.

Lieut. W. G. Stuart to be Lieut., Grade (A) from (Ad.); Aug. 19, 1918.

Sec. Lieut. S. G. Newport to be Lieut.; March 24 (substituted for the notification in the *Gazette* of April 11).

Sec. Lieut. (Hon. Lieut.) D. R. Mitchell to be graded for purposes of pay and allowances of Lieut. while employed as Lieut., Grade (B), from May 1 to May 14.

Lieut. N. A. Ayres to be Sec. Lieut., Grade (A), from (Ad.); Nov. 1, 1918, and to be Hon. Lieut. (substituted for the notification in the *Gazette* of Nov. 22, 1918).

Sec. Lieut. W. W. Hammond to be Sec. Lieut., Grade (B), from Grade (A); June 25 (substituted for the notification in the *Gazette* of June 13).

Sec. Lieut. (Hon. Lieut.) E. A. Horan (Lieut., N.Z. Forces, Otago R.) relinquishes his commn. on ceasing to be employed; June 4.

(Then follow the names of 30 officers who are transfd. to the Unemployed List under various dates.)

Lieut. P. N. Shone (Lieut., S. Staffs. R.) resigns his commn., and is permitted to retain his rank; June 25.

The notification in *Gazette* May 7, 1918, concerning Lieut. G. P. Harding, M.C., is cancelled.

**Medical Branch**

Transferred to the Unemployed List:—Capt. F. A. Hampton; April 23. Capt. N. S. Gilchrist; April 30. Lieut. F. S. Drewe; May 30.

The notification in *Gazette* April 18 concerning Sec. Lieut. L. W. Jones is cancelled.

**Chaplains' Branch**

Principal Chaplain for Presbyterians.—Rev. W. Moffat (A.C.D.) is granted a temp. commn. as Chaplain, with the relative rank of Lieut.-Col., and is granted the relative rank of Col. while employed as Principal Chaplain; March 7, seniority Jan. 1 (substituted for notification in *Gazette*, Feb. 4).

**Memoranda**

Sec. Lieut. (Hon. Lieut.) R. V. J. S. Hogan to be Lieut.; April 2, 1918.

(Then follow the names of 53 Overseas Cadets granted Hon. Commns. as Sec. Lieuts.)

Maj. J. F. Dyer (Capt., Bt. Maj., E. Lancs. R.) relinquishes his commn. on ceasing to be employed; June 9.

Lieut.-Col. (Hon. Col.) L. Munro (Col., Spec. List) relinquishes his commn. on ceasing to be employed, and is permitted to retain the rank of Col.; June 16.

The following relinquish their hon. commns. on ceasing to be employed:—Temp. Hon. Capt. F. C. Lea; March 31. Temp. Hon. Lieut. J. L. Napier; June 16. Temp. Hon. Lieut. H. P. Dickinson; June 25.

The notification in the *Gazette* of April 1 concerning Capt. F. A. Ford is cancelled.

(Then follow the names of five officers who are transfd. to the Unemployed List under various dates.)

London Gazette, June 27

The following temporary appointment is made:—  
 Deputy Director.—Lieut.-Col. I. M. Bonham-Carter, O.B.E., and to be actg. Col. whilst so employed; June 8, vice Col. B. C. H. Drew, G.M.G.

The following temporary appointments are made:—

Staff Officer, 1st Class.—(Air) Lieut.-Col. G. I. Carmichael, D.S.O.; June 23.

Staff Officers, 3rd Class.—(P.) Capt. A. M. Waistell, D.S.C.; Jan. 21. (T.) Lieut. C. T. Inman; May 16, vice Lieut. D. C. Sutherland.

**Flying Branch**

Capt. W. R. Read, M.C., A.F.C., retains the grading for purposes of pay and allowances of Maj. whilst employed as Maj. (A.); June 5.

Capt. J. S. Wheelwright, D.S.C., to be Capt. (A Ship) from (T.); May 1.

Lieut. (Hon. Capt.) I. G. Roberts to be actg. Capt. whilst employed as Capt. (A.), from Dec. 18, 1918, to April 30.

Sec. Lieut. L. Michell, M.C., to be Lieut.; June 8, 1918 (substituted for notification in *Gazette*, March 7).

The following Sec. Lieuts. (late Gen. List, R.F.C., on prob.) are confirmed in their rank as Sec. Lieut. (A.):—C. H. Swan; July 13, 1918. P. H. Leigh; Aug. 24, 1918.

The following relinquish their commns. on ceasing to be employed:—Lieut. R. L. Tribe (Lieut., R.G.A.); June 20, 1918. Lieut. W. J. Blitch, D.C.M. (Lieut., W. Ont. R.); Oct. 19, 1918. Lieut. G. T. Henderson (Lieut., R.A.S.C.); Nov. 1, 1918. Lieut. H. E. Merritt (Lieut., Northumb. Fus.); Feb. 26. Sec. Lieut. (Hon. Lieut.) E. A. Bradshaw (Lieut., C.A.S.C.); April 14. Sec. Lieut. (Hon. Lieut.) L. S. Dell (Lieut., R.F.A.); May 14.

Capt. G. O. Johnson, M.C.; May 15. Sec. Lieut. (Hon. Lieut.) J. D. Le Grove (Lieut., W. York. R.), Lieut. J. P. Nickalls (Lieut., R.F.A.); June 2.

Lieut. W. H. S. Towell (R.N.); June 6. Lieut. N. Partridge (Lieut., Manitoba R.); June 9. Capt. F. W. I. V. Fraser, O.B.E., M.C. (Capt., Sea. Highrs.); June 12. Sec. Lieut. J. Brewster (Sec. Lieut., R. Berks. R.); June 13.

(Then follow the names of 153 officers who are transfd. to the Unemployed List under various dates. We regret that owing to great pressure on our space it is impossible to reprint this portion of the List.)

Maj. A. D. Bell-Irving, M.C. (Gordon Highrs.) relinquishes his commn. on account of ill-health contracted on active service; June 24.

Maj. A. C. Clarke (Capt., Welsh R.), resigns his commn., and is permitted to retain his rank; June 28.

Maj. A. Leamon-Berry is cashiered by sentence of General Court-Martial; June 6.

The following Cpts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—J. E. Brewin; June 13. L. H. F. Irving (contracted on active service); June 18.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—S. F. Napper; June 12 (substituted for notification in the *Gazette* March 21). L. R. Sinclair (contracted on active service); June 17. L. F. Cocks (contracted on active service); June 19. C. W. G. Ratsey (contracted on active service); June 23.

The following Sec. Lieuts. relinquish their comms. on account of ill-health, and are permitted to retain their rank:—J. R. Johnson; May 9 (substituted for notification in the *Gazette* Feb. 21). W. N. Matthews; June 19.

Sec. Lieut. A. F. V. Clark is removed the Service; May 9.  
The appointment of Sec. Lieut. G. P. Kells is antedated to Aug. 26, 1918.  
The initials of Lieut. G. A. Brooke are as now described, and not G. M., as stated in the *Gazette* April 29. The rank and initials of Sec. Lieut. H. Gatfield are as now described, and not "Lieut. H. H. Gatfield," as stated in the *Gazette* April 29. The initials of Lieut. R. W. P. Goodwin are as now described, and not as stated in *Gazette* of May 2. The Christian names of Lieut. Harvey Allan Miller are as now described, and not "Harry Allan," as stated in *Gazette* of June 17. The Christian names of William George Edwards are as now described, and not "William Edwards," as stated in *Gazette* of Aug. 6, 1918. The surname of T. C. Beeken is as now described, and not "Becker," as stated in *Gazette* of Feb. 14. The surname of Lieut. S. A. Oades, M.C., is as now described, and not "Oudes," as stated in *Gazette* of April 29. The surname of Lieut. P. C. Norton is as now described, and not "Morton," as stated in *Gazette* of April 29. The surname of Sec. Lieut. W. K. J. Shirlaw is as now described and not "Shirlam," as stated in *Gazette* of April 29. The surname of Lieut. L. C. Jarrett is as now described, and not "Janett," as stated in *Gazette* of May 2. The surname of Lieut. A. R. Browne is as now described, and not "Brown," as stated in *Gazette* of April 29. The surname of Sec. Lieut. J. J. Comerford is as now described, and not "Comerfield," as stated in *Gazette* of May 6.

The notification in *Gazette* of June 6 concerning Lieut. (actg. Capt.) H. C. Sootheran is cancelled.

The notification in *Gazette* of Feb. 4 concerning Lieut. A. G. Niven is cancelled.

The notification in *Gazette* of April 15 concerning Sec. Lieut. W. T. Neilson is cancelled. (*Gazette* notice of May 27 to stand.)

#### Administrative Branch

Sec. Lieut. C. E. Yates to be actg. Capt. whilst employed as Capt., from Jan. 15 to April 30.

Capt. J. F. Hay to be graded for purposes of pay and allowances of Lieut. from (S.); Jan. 8 (substituted for notification in *Gazette* of Feb. 25).

Lieut. A. S. Budge to be Lieut., from (K.B.); April 17.

Lieuts. to be Lieuts., from (S.O.):—G. Verden; May 18. (Hon. Capt.) P. V. G. Van der Byl, M.C.; June 1.

Sec. Lieut. E. A. Williams to be actg. Lieut. whilst employed as Lieut., from Sept. 16, 1918, to April 30.

Sec. Lieut. J. H. Blackey to be Sec. Lieut., from (A.); June 5.

Sec. Lieuts. to be Sec. Lieuts., from (K.B.):—H. F. Turner, R. G. Smith; April 17.

Sec. Lieuts. to be Sec. Lieuts., from (O.):—H. S. Gargett, and to be Hon. Lieut.; June 3. C. W. Clutson; June 4.

The following are granted temp. comms. as Sec. Lieuts.:—W. Brown, T. G. Cemery, C. L. Helsdon, T. H. Jolley, R. N. Tomkins, H. J. Vale; June 24.



## AVIATION IN PARLIAMENT

### Post-War Conditions of R.A.F. Service

MR. RAPER, in the House of Commons on June 24, asked the Under-Secretary of State for the Air Ministry if he can now make a statement as to post-war conditions of service in the Royal Air Force?

The Under-Secretary of State for Air (Maj.-Genl. Seely): The final consideration of this question is now proceeding, and will, I hope, be completed very shortly.

Mr. Raper: Is the hon. and gallant gentleman aware of the fact that the uncertain state of the future conditions of the Air Force prevents a large number of ex-officers of the Air Force arriving at a decision as to their future career?

Maj.-Genl. Seely: I am fully aware that it is a most urgent matter to come to a decision on this question. If my hon. and gallant friend will put down a question in a fortnight's time I hope to be able to give him a full statement.

### Air Ministry (Staff)

MR. ARNOLD asked the Under-Secretary of State to the Air Ministry the number of the staff of the Air Ministry on May 31, 1919, as compared with the number on the date of the Armistice, November 11, 1918?

Maj.-Genl. Seely: The number of persons of all types employed in the Air Ministry at the Armistice was 4,646 and on May 31, 1919, it will be understood that the large amount of work due to demobilisation has necessitated the retention of a large clerical staff.

### The Women's Royal Air Force

LIEUT.-COMDR. KENWORTHY on June 25 asked the Under-Secretary of State to the Air Ministry what was the numerical strength of the Women's Royal Air Force, officers and other ranks, respectively, on November 1, 1918, and on June 1, 1919?

The Under-Secretary of State for Air (Maj.-Genl. Seely): The figures are as follows:—

November 1, 1918, 496 officers, 25,062 other ranks.

June 1, 1919, 442 officers, 20,419 other ranks.

The figures for November 1 include 24 officers and 1,543 other ranks Women's Royal Naval Service serving at Women's Royal Air Force Stations and subsequently transferred to that force.

Lieut.-Comdr. Kenworthy: Will the right hon. gentleman consider the hastening of the demobilisation of these ladies, in order to give employment to discharged unemployed soldiers?

Maj.-Genl. Seely: Yes, Sir; that is being borne in mind. The process of reduction is continuing. Of course during the very rapid demobilisation of the men of the Royal Air Force we depend principally upon the women to carry us through this difficult period.

### Air Navigation

CAPT. WEDGWOOD BENN on June 26 asked the Under-Secretary of State for Air (1) whether any sextant suitable for taking bearings in the air is in use or being experimented with; (2) what liaison exists between the Air Ministry and the Admiralty with a view to applying to air navigation the experience of the Navy; (3) what is the staff of the Air Navigation School; and whether it includes any qualified marine navigators; (4) what progress is being made in instruction in taking bearings in the air?

The Under-Secretary of State for Air (Major-General Seely): At the moment the whole system of instruction in aerial navigation is being revised, and the schools of aerial navigation re-organised; and in this process we shall certainly keep in close touch with all those whose experience of aerial or marine navigation is likely to be of assistance, and endeavour to perfect, as far as possible, all mechanical aids to navigation, such as sextants. Experiments with various types of sextant are already being carried out with this object.

At the present moment there is great hope of the early development of a satisfactory artificial horizon sextant and experiments are now being carried out at the Royal Air Force experimental establishments with a view to its early perfection. I would add that the officers who are dealing with this question will be very glad if my hon. and gallant friend will give them the benefit of his advice and criticism.

Capt. Benn: Is the Air Force taking full advantage of the navigating experience of the Admiralty? That is the point.

Major-General Seely: Yes, Sir. I think we may say we are working in absolutely close co-operation with them, and many of the officers dealing with this matter have themselves sea experience.

Capt. Benn: Are any of the instructors in the navigation schools naval officers?

Major-General Seely: Speaking from recollection, many of them are or have been in the Navy. I should like to have a precise question on that point.

Lieut.-Comdr. Kenworthy: Are there any navigating officers among the instructors?

Major-General Seely: I must have notice as to the precise number of navigating officers. My hon. and gallant friend is aware that many of our Air Force officers guiding us in this matter are naval officers.

Capt. Benn: Are they naval officers or members of the Royal Naval Air Service, which is different?

Maj.-Genl. Seely: Both.

### Aeroplanes (Cypress Wood)

MR. REMER asked the Under-Secretary of State for Air whether, in view of the fact that the use of cypress on aeroplanes cost the nation over a quarter of a million sterling, he will appoint a small Committee of Enquiry to go into the whole circumstances?

Maj.-Genl. Seely: The matter has already been fully investigated. The decision to use cypress was taken by the Department on expert advice as a war measure to meet a pressing emergency. I see no reason for a special Committee of Enquiry.

Mr. Remer asked the Under-Secretary of State for Air whether his attention has been called to a minute in his Department proving that one of his present advisers on timber was the official responsible for sanctioning the use of cypress; and what action he intends to take?

Maj.-Genl. Seely: I do not know to what document my hon. friend refers in the first part of the question. But, in any case, I do not think any further action is required.

### Timber Transport

MR. REMER asked the Under-Secretary of State for Air whether large quantities of timber were dispatched by rail from Glasgow to London for no other purposes but to be stored; and whether, in view of the fact that traders are complaining of congestion on the railways he will take steps to see that no waste of transport facilities is incurred?

Maj.-Genl. Seely: I am unable to trace the incident referred to; but if my hon. friend will supply fuller particulars I will have further enquiries made.

### Flying Boats

LIEUT.-COMDR. KENWORTHY asked the Under-Secretary of State for Air what is the cost for construction of the R 34 type of airship; what is the cost of its shed; what is the personnel required at the shed for handling the airship, etc.; what is the estimated total monthly cost of the airship when in commission, including pay of personnel; and what is the cost of the N 3 B type of flying boat seaplane, 1919, pattern?

Maj.-Genl. Seely: The first part of the question is for the Board of Admiralty, and perhaps the hon. and gallant member will address the question to them. The cost of the latest flying boat built to N 3 B specification is £9,000 complete with engines; the specification is, however, not a new one.

Lieut.-Comdr. Kenworthy: What is the cost of the shed?

Maj.-Genl. Seely: Questions as to the shed of the airship should be addressed to the Admiralty. They ordered the ships, although the Air Ministry had control of them for experimental purposes. The actual details of the contract price should be asked of the Admiralty.

Lieut.-Comdr. Kenworthy: What is the personnel? Has the right hon. gentleman information as to the number of persons necessary to handle this airship?

Maj.-Genl. Seely: I have suggested that on that point also the question should be addressed to the Admiralty. I included that in the first part of the answer. I think they will be able to give the information required.

Capt. Benn: Are we to understand from that answer that the Air Ministry has not complete control over the lighter-than-air material?

Maj.-Genl. Seely: Yes, that is so. At present we have not complete control of lighter-than-air ships. With regard to personnel, we are responsible for that. The matter is complicated, but it will be adjusted in a very short time.

### Dogs (Importation)

COL. WESTON on June 26 asked the Under-Secretary of State to the Air Ministry, in view of the official report that 64 dogs had been illegally imported, what precautions are taken to guard against dogs kept in an aerodrome being infected with rabies in the event of a dog being imported?

Maj.-Genl. Seely: The irregular importation of dogs is strictly forbidden, and under existing Orders should be impossible. I am sending my hon. and gallant friend a copy of the Order.

Col. Weston asked the Parliamentary Secretary to the Board of Agriculture, in view of the official report that at one aerodrome there had been 64 dogs illegally imported, whether he had received any proof of a case of illegal landing by means of aeroplane?

Mr. Pratt: The Board of Agriculture have received no official report of the illegal landing in this country of any dog by aeroplane?

### Royal Naval Volunteer Reserve (Anti-Aircraft Corps)

MR. LAMBERT asked the First Lord of the Admiralty whether petty officers and men who served in the Royal Naval Volunteer Reserve (Anti-Aircraft Corps) (Defences of London), 1914-16, are entitled to a war gratuity?

Dr. Macnamara: I would refer my right hon. friend to the reply given to the hon. member for Rotherhithe on March 3 last, in which I stated that men who rendered whole-time service in the Royal Naval Anti-Aircraft Corps are eligible for the naval war gratuity. Those who served for half-time only are debarred unless they subsequently served in the Army or Navy, in which case they would be eligible for a gratuity assessed on the whole of their war service.



## THE BROCK BULLET CLAIM

THE Royal Commission on Awards to Inventors sat at No. 2, Queen Anne's Gate Buildings, Westminster, on June 30, Mr. Justice Sargant presiding, when amongst the claims was one on behalf of Mrs. Brock, widow of Commander Brock, in respect of the Brock bullet, which was used in attacking and destroying Zeppelins.

Mr. Albert, a brother-in-law of the late Com. Brock, appeared on behalf of the claimant, and stated that the claim was brought on the definite instructions of Com. Brock, contained in a letter written a few days before he went to Zeebrugge, where he lost his life. It was due to his memory that there should be the fullest public recognition and acknowledgment of what was admitted to be a very valuable invention.

The Brock bullet had not been patented, and no one who knew the late Com. Brock would be the least surprised at that. He was glad to think that the State had unrestricted use of the invention. Apart from that, he was a man of many parts, and as soon as he had achieved success in one direction he turned his attention to another. Com. Brock had remarked that he had finished the Zeppelins, and he was going to do the same thing to the submarines. In 1916 a Conference awarded certain marks to the different types of bullets, taking into consideration the perseverance of the inventor, the civil and military value, and the restoration of public confidence. That Committee decided that the Brock bullet was worth 31½ per cent. and the Pomeroy bullet 35 per cent.

Mr. Trevor Watson: It was agreed at that time that a Zeppelin should be taken at an arbitrary value of £70,000.

Mr. Albert referred to the history of the invention, and said that it was believed at one time that the Germans had found some means of countering an attack with the bullets then in use, and Com. Brock set to work to find a bullet which would effectively function upon striking the fabric of the Zeppelin. It was in the summer or autumn of 1916 that the first three or four Zeppelins were brought down. A note which had been found among Com. Brock's papers showed that he believed that his bullet had succeeded in firing a balloon at 200 yards' range; that his bullet had been present in every mixture of bullets used against Zeppelins, and that it was the chief factor in destroying the menace.

Com. Brock had attached to his papers two reports by well-known airmen, Lieuts. Sowrey and Brandon. The former wrote that his first two drums of ammunition had apparently no effect, while the third caused the envelope to catch fire in several places. He fired traversing fire along the envelope. That, said Mr. Albert, was very important, because the Pomeroy bullet would only function against a hard substance, and when fire was traversed along the envelope, the Pomeroy bullet, to say the least, had a remote chance of hitting a hard substance.

It was a great misfortune that Lieut. Robinson was dead, because he was the one officer who had congratulated Com. Brock on the success of his bullet. It was known quite well in Com. Brock's family that Lieut. Robinson and his squadron accepted as a fact that the Brock bullet had brought down the Zeppelin. It had been testified that the first three German Zeppelins that were destroyed were attacked with guns whose drums were filled one-third with Brock bullets.

The orders placed by the Minister of Munitions for Brock bullets were 497,000 rounds. The Admiralty had ordered 105,000 rounds. The Military Wing ordered 500,000 rounds, and 497,000 rounds were delivered. They returned 400,000 rounds to Woolwich for disposal, as they considered that the Brock bullet was too sensitive.

In 1916 the Zeppelins were not so very numerous, and our defence was not organised on a large scale. Attacking Zeppelins at night was in its infancy, and it was considered highly dangerous to order an aeroplane to attack a Zeppelin until they had got a good bullet to bring the Zeppelin down.

The Chairman: The Brock bullet was invented solely for the destruction of Zeppelins?—Yes, and it was a bullet that was necessarily restricted to home defence purposes.

Mr. Albert further pointed out that an aeroplane attacking

a Zeppelin could not get closer than a certain distance, and what was wanted was a bullet that would function more or less at a safe range. The Buckingham bullet lighted at the muzzle of the gun, while the Brock bullet functioned on impact, and was both explosive and incendiary. The greatest moral and material damage was done to the enemy when it was proved that we possessed effective counter measures. He said that it was possible for an airman to say which type of bullet was functioning when he fired a mixture of Brock, Pomeroy, and tracer bullets. If they could not say so in the case of the Brock bullet, it must be equally true in the case of the Pomeroy bullet, for which an award of £25,000 had been made.

Sir William Pope, Cambridge, giving evidence in support of the claim, said that in 1915 he met Com. Brock and discussed with him the question of the destruction of Zeppelins. The conclusion had been come to that the bullet then being used, the Pomeroy, was ineffective, and they formed the idea that the Germans had introduced some protective device. What was really required was a bullet which would fire on striking the fabric and blow a hole in the fabric of a foot in diameter, to permit the rapid escape of gas. It was quite clear that the bullet must be extremely sensitive. One point in favour of the Brock bullet must be the fact that the Military Wing had returned a large number of rounds. It was far too sensitive for the varied purposes of the Military Wing. As soon as the Brock bullet was introduced, positive results were obtained, and these could only have been obtained if the Brock bullet functioned as it was intended to function.

Col. Fellowes, R.A.F., said that he had been directly connected with the development of the bullets, and at that time the Zeppelin menace was more a naval than an army business. As far as the bullets were concerned, the Buckingham bullet would have brought down a Zeppelin, but they did not know it at the time, and he was not prepared to say that the Buckingham bullet would do it. He was under the impression that the Buckingham bullet was very much less sensitive than the Brock bullet.

The Chairman: Could one Brock bullet blow a hole in the fabric and ignite the gas at the same time?—Yes, I think one Brock bullet would destroy a Zeppelin.

The witness added that he did not think the Pomeroy bullet was sufficiently sensitive to blow a hole in the fabric.

Col. Forbes, of the Aircraft Armoury Department, said that the order was issued to load the drums with Brock, Pomeroy, and Buckingham bullets to give every one a chance. They were rather open-minded about it, he added.

The witness pointed out that, in reference to the statement that a pilot would not be able to distinguish a bullet functioning, he had been asked by the Admiralty for his opinion, and his reply was that if a pilot saw a Pomeroy and Brock explode together he would not be able to differentiate between them. He did not mean to infer anything more. There might be reasons which enabled a man to distinguish certain bullets.

Capt. R. W. B. Billingham gave evidence in regard to certain trials which were carried out shortly after the Cuffley Zeppelin was brought down. A mixture of Pomeroy and tracer bullets did not prove effective, while Brock bullets alone fired a balloon after about six shots.

Mr. Trevor Watson, on behalf of the Admiralty, paid a warm tribute to the services rendered to the country by the late Com. Brock. Nothing in his life was more characteristic of him than the manner of his leaving it. He had come to the conclusion that there was a German range-finder which was better than anything we had got, and he pleaded to be allowed to go to Zeebrugge because it would give him an opportunity of finding out. It was while he was examining this range-finder on the Mole that he met his death.

The Chairman said that he thought the case was one that the Commission ought to deal with on its merits. The decision of the Commission would be announced to the Treasury in due course.

### A Canadian Air Board

UNDER the Act passed this Session the Government has appointed an Air Board, of which Mr. A. L. Sifton, Minister of Customs, is chairman, and Lieut.-Col. Biggar vice-chairman, while the other members include General Mewburn, Minister of Militia, Mr. C. C. Ballantyne, Minister for Naval Affairs, and Dr. Coulter, Deputy Postmaster-General. The

inclusion of the last-named indicates that aerial mails will be considered.

The Board has the supervision of all matters connected with aeronautics, and the control and management of aircraft necessary for the conduct of the public service, the fixing of air routes, and regulations for a commercial air service.

## SIDE-WINDS

IMPORTANT additions have been made to the long list of successes that stand to the credit of "K.I.G." sparking-plugs. Capt. Gathergood, winner of the Aerial Derby, had this reliable make fitted to his Airco-Napier, and the second and third prize-winners—Lieut. Nisbet and Maj. Draper—also used them, as did Capt. Sir John Alcock in his Transatlantic flight.

THOSE who have admired Mr. Geoffrey Watson's paintings of aeroplanes will be interested to know that there are always examples of his work on view at the Brook Street Art Gallery, 14, Brook Street, New Bond Street, W. 1. The Gallery publish a little booklet giving some reproductions of Mr. Watson's works, and they will be pleased to send a copy to any of our readers who apply to the Secretary, Mr. Chas. Seaborn.

THE annual dinner of the firm and employees of Messrs. William Cole and Sons, Ltd., the well-known aeroplane and body-builders of Hammersmith, took place last Saturday evening at the Cafe Monico. In every sense it was a reunion. The managing director, Mr. Albert E. Cole, was in the chair, and the company numbered some 350 employees and guests of the firm. After the usual loyal toasts had been honoured, Mr. Albert E. Cole dwelt upon the happy intimate relations that had always existed between employees and the heads of the firm, and the mutual confidence thus established from the pre-War days, which the greater stress of War-production, with all its difficulties, had if possible only increased. That spirit, he felt sure, would not only endure in their own case, but was the only one upon which an enduring prosperity could be built for British industry, as between Capital and Labour. All would agree that when, as with the firm of William Cole and Sons, Ltd., every one recognised his own share in the community of interest, all differences or difficulties of the moment, as they cropped up from time to time, would disappear. The two sides of such a business were inseparable, and he was glad to feel that, in the case of his own firm, they always met as friends and partners. Then followed a pleasing interlude, the presentation of silver cigarette-boxes to the pre-War employees of the firm, who were among the first to volunteer in 1914-5; after which a concert—in which all the artistes were from among the employees—filled up the remainder of a very pleasant evening; the talent displayed by most of the performers being quite of professional quality.

On Saturday last, June 28 (writes "G.H.H."), I allowed pleasure to seduce me from business for a day, the occasion being the twelfth annual excursion of the staff and employees of the Acetylene Equipment Co., Ltd.

At 9 a.m. 100 revellers gathered at Richmond Pier, a launch taking us up river to Chertsey, where we lunched, the venue being the Cricketers' Hotel. Dirty work on the part of some Q-ships in a lock en route made our arrival a little behind schedule, but the hold-up was soon forgotten in the face of more engrossing business, of a putting-down nature. After the interval we got aboard again and steamed down to Molesey, arriving at the Thames Hotel, Hampton Court, in nice time for dinner.

Several of the company's agents were among the party, and of these a few made little speeches, as bright as they were brief. Mr. Leonard M. Fox, who was in charge of the outing, announced that as the weather had been just as perfect this year as for twelve years past, in future the date must be permanently fixed for the last Saturday in June. Except for one suggested amendment that it should be the last Saturday in each week, Mr. Fox's resolution, like the memory of a really great day, was carried unanimously.

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### H.P. Model Aero Club

ABOUT 40 of the apprentices and improvers at Messrs. Handley Page's works have formed a model aero club to promote competitions and to give instruction in all forms of aeronautical engineering. Mr. F. Handley Page is President, while Messrs. Theodore Page, R. S. Hubbard, C. W. Meredith and E. Grenfell, are the Vice-Presidents. The Chairman of the Committee is Mr. C. Solly, while Mr. F. R. Grahame Hodgson is Treasurer, and Mr. A. E. Mitchell Secretary. The Club's temporary headquarters are at Somerton Road, Cricklewood.

### The Tarrant Triplane Disaster

MR. J. T. COGGINS, Deputy Coroner for Aldershot, on June 26 resumed the inquest on Capt. P. T. Rawlings, D.F.C., and Capt. F. G. Dunn, the two pilots who met their death in the disaster to the Tarrant triplane at Farnborough on May 26.

Mr. Tarrant said that on the morning of the trial flight Capt. Dunn made no adverse comment on the machine, but was very confident of it.

Brig.-Gen. Brooke-Popham, Director of Research, said that on the report of experts he gave sanction for the trial to take place. There had been an official enquiry, but he was instructed to claim privilege for the report.

Evidence was also given by Col. the Master of Sempill, R.A.F., Lieut. C. H. Vickers, R.A.F.

The jury returned a verdict of "Accidental Death."

The foreman said they unanimously felt that something should come out that had not come out. They felt that there was something kept in the background which they should know. Two brave men met their deaths, and they should know the reason why.

### Whitehead Aircraft (1917), Ltd.

In the Companies (Winding-up) Court, before Mr. Justice P. O. Lawrence, a petition for the winding-up of Whitehead Aircraft (1917) was presented on June 23 by New Pegamoid, 134, Queen Victoria Street, E.C., and Hobday Brothers, 25, Great Eastern Street, E.C. The petition is to be heard on July 8.

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### NEW COMPANIES REGISTERED

EXPRESS TRANSPORT, LTD.—Capital £50,000, in £1 shares. Objects: To carry on the business of transporters of passengers and goods by land, water or air, etc.

GREAT NORTHERN AERIAL SYNDICATE, LTD., 25, Lord Street, Liverpool.—Capital £10,000 in 5s. shares. Organisers, etc., especially in the business of commercial aviation manufacturers and designers of aircraft, proprietors of schools of aviation, etc. First directors:—C. Sutherland, C. H. Bullen, R. H. Taylor, W. J. Todd, W. E. Cooke, E. G. Noakes, L. E. Stephens.

JOHN BURTON, LTD., 11, Queen Insurance Buildings, Dale Street, Liverpool.—Capital £7,000, in £1 shares. Acquiring business carried on at Liverpool as "Burton Bros.," carriers by land, air and water, etc. Directors: J. T. and W. H. Burton and G. H. Hopkins.

SOUTH OF SCOTLAND ELECTRICAL AND MECHANICAL ENGINEERING CO., LTD.—Capital £5,000, in £1 shares. Makers of aeronautical engines, motors, etc. First directors: H. J. Berry, Edgar Moodycliffe, Samuel W. Marshall, James Clarke McGeorge, junr., and A. G. McGeorge. (Scotch Co.)

WAR TROPHIES, LTD., Peninsular House, Monument Street, E.C.—Capital £5,000, in £1 shares. Dealers in cannon, machine guns, implements of war, aeroplanes, battle souvenirs, trophies, etc. Director: E. G. Palmer.

If you require anything pertaining to aviation, study "FLIGHT's" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages lili, liv, lv and lvi)

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